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ITS NATURE, CAUSES PREVENTION AND CURE

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CONSUMPTION

ITS

NATURE, CAUSES, PREVENTION AND CURE

BY

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INTRODUCTORY.

CONSUMPTION—portentous word; word of sad reminder to thousands of families whose diminished membership is the result of the disease it designates. Word indicative of apprehension to thousands of other families, who dread its occurrence in some of the brightest and most loved of the family circle. Probably over three million members of the human race are swept from life each year by pulmonary consumption, or phthisis, as we shall designate the disease in the following pages, that being the name most frequently given to it by the medical profession. Ghastly monumental epitaph in record of the ignorance, slothfulness, and unfortunate surroundings and conditions incident to the lives of the great majority of the human race. If during some unusual epidemic,—as of yellow fever or cholera, for example,—a few thousand in-

dividuals die, the whole social fabric is stirred to its depths. Governments and individuals pour out their resources lavishly to promote investigation, to institute preventive measures, and to offer immediate succor to the afflicted; but hundreds of thousands die of phthisis each year in the more civilized countries, and yet the general community is not stirred in the least. Man has the facility of soon becoming "used" to the conditions which surround him, even if they are evil ones that imperatively need correction; and his apathy in regard to the scourge of phthisis is a forcible and deplorable example of this adaptability.

The *laity*, in ignorance of the subject, look upon phthisis as one of those mysterious providences which must be accepted and borne, along with many other incomprehensible experiences and disciplines; and we are not sure but that the *profession* of a generation or so ago took somewhat the same view of the malady. Even in this day, it would seem that the physician is too liable to look upon phthisis as a

very uninteresting and hopeless disease, merely calling for the usual prescription of cod-liver oil and a trip to Florida. The profession continually sees throughout whole communities *in-and-in* breeding of consumptives, and methods of living from day to day which must surely keep up the consumptive death-rate; yet how often does it lift up its voice in protest? It is a serious question as to whether a physician's whole duty extends only to the *cure* of disease. Some fatalist might say, "Why agitate the matter? If it were not for disease, war, and famine the earth would soon be over-populated." We should say that if the world is in danger of being over-populated, the remedy should consist in shutting off the supply, and not in killing off the surplus of its inhabitants. It is our opinion, that the life which is worthy of generation, is worthy of being lived out to the fulness of its cycle. If man is a progressive creation, this bearing and rearing of individuals to a period when they are just about ready to live and give the world the ben-

efit of their experience and work, and then to have them cut down by disease, would seem a great waste of force. We decidedly believe that the world would be more of a beneficiary, if with criminals, paupers, the insane and scrofulous, consumptives were not allowed to breed and perpetuate through their progeny their miserable, inefficient, and trouble-giving existence. We believe that the time will come when the *law*, supported by the sentiment of society, will demand a health fitness as one of the requisites of a legal marriage. It is probably true, that so long as man's social condition is anything like what it is at present, and he is at all subject to disease, phthisis will exist; but this malady is largely preventable, and if the conditions are favorable, it is a curable disease. It is anything but an honor to the profession that such a frightfully large number of the human race become its victims. Why should not some of the energy that is yearly expended in writing book upon book on the nature of tubercle, be spent in devising and spreading

abroad knowledge of the measures which would be preventive of the disease? But tubercle has been worshipped, and very little has been done to prevent the race from becoming tuberculous, the patients having been rather left to shift for themselves in the way of treatment. It is encouraging to know that during the last twenty-five years the general advance of knowledge, and its diffusion, has had an appreciable effect in reducing the phthisical death-rate.

Before discussing the treatment of this disease, it will be proper to describe briefly its nature, symptoms, causes, etc. It will also be desirable to give a short description of the anatomy, physiology, and hygiene, of the structures in which the disease usually occurs—that is to say, the pulmonary organs—so that the rationale of the treatment may be more obvious.

THE ANATOMY, PHYSIOLOGY AND HYGIENE OF THE PULMONARY STRUCTURES.

ONE of the prime requirements for the nutrition of the human body, is that every minute element in it should be constantly in a state of chemical activity, oxygen being the prominent agent in producing this action. The oxygen producing this action is derived from the atmosphere. It is absorbed into the blood, and that nutritive current carries it to every part of the body. The oxygenation of the blood current has to be continuous. If it is remitted for even a very few moments in man, the result is death. The method by which oxygen is continuously transferred from the atmosphere to the blood is called the function of respiration, or breathing. The special structures which carry out this function are the lungs, and the adjunct mechanism necessary for producing motion in them. The lungs are designed for the purpose of ex-

posing a very extended surface of blood to intimate atmospheric contact, and incidentally, for fulfilling the purposes of an air reservoir. To carry out these functions, we find the construction of the two pulmonary organs, known as the right lung and the left lung, to consist of an immense number of very small air cavities, or air cells, as they are more frequently called, which communicate by air passages, known as bronchial tubes, with the windpipe, or trachea, which leads into the throat. Let us follow the air on its way to the pulmonary air cells. It enters the nasal passages, passes through them into the pharynx, or throat, where air can also arrive by way of the mouth if necessary. At the base of the tongue is the larynx, the mechanism which produces the unmodified sounds of the voice. It is a continuation of the upper extremity of the trachea or windpipe. The opening through the larynx is a fissure that dilates when air is drawn into the lungs. The air current passing it and traversing the trachea for about four inches, is di-

vided at the upper part of the breast-bone into two streams, one of which passes to each lung by way of a large bronchial tube. These large bronchial tubes divide into others, and these in turn continue to divide and subdivide, until there are thousands of fine tubes, known as capillary bronchial tubes, leading from the larger ones. Finally, these capillary or hair-like tubes terminate in an air sack called a vestibule. Clustered around this vestibule, and leading into it, are a number of the pulmonary air cells before mentioned. The arrangement of the air cells, vestibules, and terminal bronchial tubes is such as to remind one of a bunch of grapes. It will be seen that in its configuration this whole system of tubes and cells is the analogue of a tree, the trachea representing the trunk, the bronchial tubes the branches, and the innumerable air sacks and cells the leaves. Each of the pulmonary air cells is closely surrounded by a net-work of blood-vessels of hair-like minuteness. These are the small terminal branches of the pulmonary artery.

This large vessel conveys to them from the right side of the heart the dark venous blood, which has been deprived of its oxygen in its course through the circle of blood-vessels extended throughout the body, and which has become loaded with carbonic acid gas. This gas is a result of the chemical action continually taking place in the various parts of the human structure. In passing through the pulmonary net-work of blood-vessels, this dark venous blood loses its excessive carbonic acid gas and is aerified, free oxygen being absorbed into it. Thus oxygenated, and with its color changed to a light rich red, it becomes arterial blood, and is returned by the pulmonary veins to the left side of the heart, from whence it is distributed to the whole organism by way of the large arteries and their branches. The lungs are also supplied and nourished by the bronchial arteries and their branches. In proportion to weight, there are no other structures that are so freely supplied with blood-vessels as the lungs. The combined extent of

the surface of the air cells is many times greater than that of the external surface of the body. The air cells being lined by an exceedingly thin and delicate membrane, and the small blood-vessels having coats also very thin and soft in texture, it will be seen that the structural requirement of exposing a large surface of blood to atmospheric contact is furnished. The thinness and delicacy of the membranes interposed between the blood and air gives very slight interference to the complete mingling of the two. It must be known that gases will readily pass through almost any material, by means of a force peculiar to them, known as diffusion. This is a sort of repulsion of the gas atoms for each other. The pulmonary structure is strong enough in health to retain the blood in its vessels, but it does not prevent oxygen or other gases from passing freely through any of the walls of those vessels. The distance of the pulmonary air cells from the outer world prevents, in a great measure, their delicate texture from being injured by those

injurious matters found in the air, such as dust, etc., which are deposited on the surface of the air tract higher up. Very hot or very cold air is tempered in its passage through the air tubes before it reaches the delicate surfaces of the air cells. These air tubes, air cells, blood-vessels, and some nerves and lymph channels, are held in their relative positions by a frame-work composed of a small amount of elastic fibrous material, known as connective tissue. This frame-work is very much like an elastic sponge, which quality gives the lungs their power of expanding during the act of inspiration, when air is drawn into them, and of spontaneous partial retraction during expiration, when air is driven out of the pulmonary organs. It must be noted here that all the membranes lining the air cells, the coats of the arteries, etc., are composed, as are other animal tissues, of an aggregation of an immense number of microscopic cells of somewhat varying shape and appearance. When speaking of these cells, they must not be con-

founded with the pulmonary *air* cells, which are cavities. The term cell is applied to both the cavity and the small bit of protoplasm, of which united myriads constitute the whole human structure.

One of the terminal bronchial tubes and its attached air cells form one of the many lobules of which the lungs are composed. A number of these lobules form the larger lobes of the lungs. The right lung has three lobes, separated by deep fissures, while the left lung has only two lobes. The general shape of the lungs is that of the interior of the whole chest, which they fill, except such of the middle part as is occupied by a partition which runs from the breast bone to the spinal column, and which contains the heart, great blood-vessels, etc. The shape of each lung is that of an irregular pyramid, having a concave base, corresponding with the upper surface of the diaphragm upon which it rests, and somewhat cut off on the inside to correspond with the surface of the aforesaid partition, with which it is in contact. The left lung is

considerably excavated at the inner base in front, to make space for the heart, which is there located. The lungs are suspended in the cavities of the chest by means of their roots, which are composed of the main bronchial tubes, blood-vessels, etc. Except at the points where these lung-roots enter, the lungs are free to move, expanding or contracting within the cavities in which they hang. They are covered with a smooth, glistening membrane called the pleura, whose office is to lubricate the pulmonary surface, thus preventing friction between it and a similar membrane which covers the inner surface of the chest walls. This membrane is peculiarly subject to inflammations, and in phthisis is generally more or less affected during the course of the disease. The bronchial tubes are lined with mucous membrane, and those tubes of a medium and larger size are furnished with numerous mucous glands, whose office is to properly moisten and protect the surface of the membrane. This membrane is much subject to diseased

eased action, especially of the catarrhal inflammation known as bronchitis. It is universally affected in phthisis, and furnishes most of the expectorated matter produced in that affection. All of the bronchial tubes are surrounded by, and have in the structure of their walls, more or less of the elastic fibrous connective tissue before mentioned. This usually undergoes considerable increase in its bulk during the course of phthisis, and this increase is sometimes the principal change to be noticed when the diseased lungs are examined.

As the combined space contained in the various pulmonary air tubes and cells, is sufficient in their utmost state of compression, to hold a hundred and twenty cubic inches of air, and with a very deep inspiratory effort will hold about two hundred inches additional, it will be seen that in the lungs is provided a storage reservoir for air, of very respectable capacity. This provision is necessary to the carrying out of the functions of voice production, coughing, etc., and the con-

tinuous action of *the* great function of the pulmonary organs, *respiration.*

The respiratory method is as follows: Air is drawn into and expelled from the lungs by alternate changes in the shape of the chest walls; these changes first enlarging and then reducing the cubical capacity of the chest cavities. The movements which effect these changes are caused by the contraction and descent of the diaphragm, a muscular partition which closes in the base of the chest, and by the elevation and outward movement of the ribs. This occurs during inspiration, and enlarges the chest cavities, producing in them outside of the lungs a partial vacuum. The external air, acting under general atmospheric pressure, rushes through the air tubes into the lungs, expanding them so far as the recession of the internal surfaces of the chest cavities will allow. Following the movement of inspiration comes an elastic recoil of the chest walls, diaphragm, and of the lungs themselves. This is *expiration*, and its movements drive out some of the air from

the lungs. When inspiration occurs, fresh air is driven through the nose, mouth, trachea, and bronchial tubes of the first, second, and third magnitude, where it meets the residual air contained in the air cells and smaller bronchial tubes. At about this point the air current ceases, and the fresh air mingles with the gaseous contents further along, through the force which produces diffusion of gases. At the surface of the air cells, through the action of this same law, and also by so-called osmotic action, the oxygen of the air enters into loose combination with the red corpuscles of the blood, and is carried on to ultimate chemical union with the various tissues of which the body is composed. The excess of carbonic acid gas in the venous blood passes out through the surfaces of the air cells, where, with some organic impurities and watery vapor, it mingles with the air in the cells and bronchial tubes, and then, during expiration, is forced into the outer world. Here it may be taken up by vegetation as nutritive matter, and after awhile may

be once more returned to the same pair of lungs, by way of the alimentary canal and blood-vessels of the individual.

The HYGIENE of the lungs may be briefly stated as follows: The parts must receive constant nutrition and support from a blood current free from all vicious qualities, and one which contains in due proportion the elements which are requisite for their nutrition. The parts must be used to such a degree, and with such regularity, that their functions may be fully developed and maintained, but they must not be overused to such a degree that the continual waste will be greater than the building up, or the parts become too large and powerful for the requirements of the body when engaged in the *usual* avocations of life, a condition often occurring in athletes. Furthermore, the parts must not be abused by inhalation of irritating or otherwise injurious matters. The atmosphere taken into the lungs should be pure, free from excessive gaseous adulteration, and moderately dry, so that the great functional exchange of

gases, moisture, and thrown off organic impurities, may take place freely and easily. The chest walls and the adjunct structures which are concerned in the process of respiration should have their integrity preserved by proper exercise, by correct habits of posture, and by avoidance of deforming external pressure caused by improper methods of dress, or by excessive atmospheric pressure. This latter occurs when diseased processes partially close the air passages which lead to the lungs. If air cannot have a sufficiently free passage in reaching these organs, there is produced too much of an air vacuum inside the chest, and the chest walls are liable to give way before the increased external air pressure, thus leading to deformities of the chest.

From the above, it follows that in the lungs we have organs which are by reason of their *anatomical* complexity and delicacy of construction, by their *physiological* necessity of continual motion and functional activity, and by their *hygienic* requirements, peculiarly subject to disor-

ders which might arise from conditions of malnutrition, or from direct or indirect irritation, both from external and internal sources, and which if once started would be particularly difficult of correction.

THE DEFINITION, NAMES AND DIFFERENT FORMS OF PHTHISIS.

THE word phthisis in this day is generally considered to mean certain diseased processes in the lungs, which result in destruction to as much of the pulmonary structure as may be invaded by them, and which are accompanied by a marked wasting of the whole body. It is perhaps impossible to give a brief comprehensive definition of the term. A very short study of the subject only, is necessary to convince one that the word phthisis is not satisfactory as a name for the diseased processes which at the present day are indicated by it, for it only describes *one* symptom, namely, that of wasting, or consumption. The term *pulmonary consumption* is sufficient as an unscientific name, but a fully satisfactory scientific term is yet to be suggested, and in lieu of a better name, pulmonary phthisis is generally accepted by medical authorities.

When we come to name the varieties and sub-varieties of this disease we are not at such a loss. Thus, tuberculosis is a good term to designate one of them; fibroid phthisis another; and so on. Galloping consumption and seventeen-year consumption are very good lay terms to indicate certain very acute and very chronic varieties of the affection. From this it should be known that phthisis, as is so generally understood, is not one simple uncomplicated disorder of the lungs. It may be several distinct diseased processes, or one only. Although phthisis has been certainly known to exist as far back as historical records extend, and was described by the fathers in medicine, it is only within a very few years, comparatively speaking, that any doubt has been entertained as to the simple nature of the disease. Until quite recently, the existence of but one form of phthisis was admitted. All the diseased appearances observed in the disorder were supposed to be solely due to the growth or deposit in the lungs of small

bodies known as tubercles. It is true that this peculiarity is present in most cases of the disease, and may in some acute cases be the only change to be noticed in the pulmonary structures. However, as scientific study of the disorder progressed, especially as the structures were examined under the microscope, it was found that there were different forms of phthisis. Among others, were those which have been called catarrhal phthisis and fibroid phthisis, though these are poor names, and do not describe correctly the disease changes which have taken place and may be frequently observed. Nevertheless, in place of better names, tuberculosis, catarrhal phthisis, and fibroid phthisis may be used to indicate the three most characteristic appearances which are most frequently presented in this disease. Other variations are less frequently observed. They are brought about by various *infrequent* causes, and have been named as follows: scrofulous phthisis, which occurs in scrofulous individuals; pneumo-

nic phthisis, which follows inflammation of the lungs; syphilitic phthisis, due to the working of syphilis locally in the lungs; hæmorrhagic phthisis, which is caused by hæmorrhages in the lungs; embolic phthisis, which is the result of shutting off the blood from a part of the lung by some plug getting into and closing the blood-vessel which supplies the particular part; etc. It must be mentioned that different authorities give different names to these various processes, on account of their individual hypothetic opinions as to the nature of the processes and their causations. Furthermore, some authorities call by the name phthisis, certain inflammatory pneumonias, which, though having practically the same destructive effects in the lungs, are not so liable to be dangerous to life. As all of these latter types of the disease are rare in their occurrence, and as the subject would be otherwise complicated to the lay reader, only the three first named will be considered in the discussion of the subject in the following pages.

WHAT WE KNOW OF THE NATURE OF THE DISEASE.

It must be stated at the beginning, that there are certain points relating to the nature and causation of phthisis which are not yet generally accepted by the medical profession, as having been definitely settled. However, we are gradually gaining more light on the subject, and the disclosures of the past two years have been particularly valuable in throwing light on subjects which up to that time were imperfectly understood.

In the lung which is affected by phthisis we generally see three distinct pronounced disease changes at one time, any one of which may predominate. Exceptionally, one or two only of the changes may be present. The first, which is the most frequently seen, and usually the most prominent appearance, is the presence in the pulmonary structures of numerous small tubercles. These may

be thinly scattered, or thickly massed together. They are apparently joined by a web of tissue similar in appearance to connective tissue. They may be present in small, or in large numbers. They appear, if fully formed, like gray, semi-transparent, shining bodies of about the size of millet seeds. They may become somewhat larger and turn to a yellow color as they become older. They are found in almost any part of the pulmonary structure. Sometimes the material of which these tubercles is composed, instead of forming these round minute bodies, infiltrates the pulmonary structure in a diffused manner. In certain cases of acute phthisis (the galloping consumption of the laity) these tubercles are usually present in large numbers, widely disseminated throughout the lungs. When a thin slice of one of these tubercles is examined microscopically, it is found to be composed of a vast number of small cells, not to be distinguished from many of the cells found in the healthy tissues of the body. At the mar-

gin of the tubercle are to be seen large so-called mother cells and spindle-shaped cells, and the whole seems to be held together by some transparent adhesive substance. Sometimes the tubercle appears to have an interlacing fibrous frame-work. By means of a certain method of examination, in which an aniline staining fluid is used, there has lately been discovered in the tubercle certain minute rod-shaped organisms belonging to the family Bacilli. This organism has been called the Bacillus Tuberculosis. As the tubercle ages, it becomes opaque, yellow, and friable. It softens, and then acts somewhat like an abscess. One or several, by uniting, go through a process of inflammatory ulceration, and are discharged into some air passage or cavity. The result of the formation and degeneration of these tubercles is, that the pulmonary structure in which they occur is literally compressed out of existence, and in their place cavities are formed. They also induce irritation in the surrounding parts, and when breaking down, contam-

inate the general system. Occasionally the tubercles may dry up into hard, chalky masses. The time occupied during the production and continuation of the tubercle probably extends over a somewhat uniform period. New crops of tubercles are continually being formed, but if a large number are produced at one time the disorder takes on an appearance of acuteness not observable where there is a less extensive tubercular production.

The *second* distinctive diseased condition seen in the phthisical lung, is the formation of yellow cheesy masses, known as yellow or infiltrated tubercles or nodules. These are larger than the minute gray tubercles, and may attain a size as large or larger than a chestnut. These are probably formed in the vestibule and its surrounding air cells. It has been claimed that they are the result of a chronic diseased process of the walls of the air cells. They are mostly composed of cast-off matter which has formed these walls, but they also have in their compo-

sition mucus, blood cells, and granular matter. They may undergo softening and be absorbed, or may go through a process of cheesy degeneration, and be expectorated after a certain amount of softening. The nodules may become of a chalk-like nature, and either have a capsule of connective tissue formed around them, or else ulcerate their way into an air passage and be expectorated. Their formation is usually an extendedly chronic process, and results, like the tubercular formation, in destruction of the lungs from pressure and inflammation, leaving cavities, blotting out or ulcerating blood-vessels, and contaminating the general system with inflammatory and other products.

The *third* distinctive diseased appearance characteristic of this malady is an increase in the amount of the connective tissue composing the elastic frame-work of the lungs. Some authors assert that part of this new connective tissue is of a different character from that found in the healthy lung. This formation occurs in

greater or lesser amount around the bronchial tubes and blood-vessels, between the lobules and air cells, and in and around the tubercular matter. Like all new connective tissue formations, it eventually contracts and becomes permanent. It is then essentially the same as the hard, tough, white material which is formed in the scars or cicatrices of lacerated wounds, deep burns, etc. This formation destroys the healthy lung substance by displacement as it increases, and by compression during its subsequent contraction. This contraction is apt to be followed by a sinking inward of the chest walls. This can be seen externally by examining the patient's chest. In the beginning, *all* these processes are characterized by a consolidation of the pulmonary substance. Instead of being light, elastic, and compressible as in the healthy state, the lungs become heavy, inelastic, and non-compressible, the parts invaded containing little or no air. In connection with these changes, there are usually found diseased conditions in the bron-

chial tubes, and the pleura or the membrane covering the lungs. The tubercular formation may occur at the same time in the larynx, in the covering membrane of the brain, in the intestines and other parts of the body. During the disease, the blood of the individual is thin and watery, and otherwise changed. Phthisis usually commences in the upper part of the lungs, and progresses downwards. This peculiarity is probably due to the fact that the upper parts of the lungs are less freely supplied with blood than the lower lobes, and hence are liable to suffer sooner in poor states of general nutrition. Such in brief is what we *know* of the nature of these diseased processes. There are many questions relating to this subject which are not settled in the minds of all the members of the medical profession, although almost every writer holds a decided and individual belief on these points. Among these questionable points are the following: What is tubercle? How is it formed? Is it deposited? Is it an inflammation? Does it

grow? Is it implanted from without the body? Is it the result of irritation of the pulmonary structures alone? Does phthisis follow bronchitis? Is phthisis a hereditary taint? etc., etc. The differences of opinion on these and many other points are various and radical, and on them professional men have disagreed. Merely to mention the points discussed, the works that have been written upon the subject, and the names of the learned writers, would be an almost endless, as well as an unprofitable, task. So far as the purposes of this book are concerned, all this difference of opinion is of comparatively little *practical* importance. On the more important matters relating to the causation of the malady and its best methods of treatment, the most eminent members of the profession are agreed, and it is the purpose of the writer to bring forward and emphasize these practical points, rather than to discuss matters which are only of scientific interest.

THE SYMPTOMS WHICH ACCOMPANY AND ARE CHARACTERISTIC OF THE DISEASED PROCESSES.

THE three chief varieties of phthisis have each such distinctive symptoms as to make their differentiation in diagnosis a matter of no great difficulty, and these characteristic symptoms will be stated further on. There are certain symptoms *common* to every variety of phthisis. These are dyspnœa, or shortness of breath; cough; hæmoptisis, or spitting of blood; expectoration; pain; fever; accelerated pulse; disordered digestion; emaciation; diarrhœa; arrest of menstruation; change of voice; œdema, or swelling of the extremities; enlargement of the ends of the fingers; brain symptoms, etc.

Dyspnœa, with an increased rate of respiration, is always more or less present during the phthisical course, and especially after muscular exertion. It may

be one of the first things noticed. For example, after walking up stairs the patient becomes short of breath. During rest, this symptom may not be prominent. It may be due to the loss of the pulmonary substance, or to the fever which causes an extra consumption of oxygen, or to obstruction of the bronchial tubes, or to a coincident pleurisy, which would make the extensive motion of deep breathing painful to the patient.

Cough.—This is an early and constant symptom. At first it may be dry and hacking. It is apt to occur in paroxysms, and may cause nausea or vomiting. It may have a brassy, laryngeal quality, if the larynx is complicated in the disease. As the expectoration comes on, the cough becomes bronchial in quality, and with the formation of cavities it becomes deep and cavernous. The cough may be absent in the insane, and also when the patient has any other prominent disease. Nervous coughs, the result of reflex irritations, may be confounded with a phthisical cough. The original seat of

irritation in these cases may be in the uterus, the abdomen, the eyes, or in other localities. Hypochondriacal and hysterical cases may also have coughs which simulate that of phthisis.

Hæmoptisis.—The spitting of blood, in amounts varying from a slight streak in the expectorated matter, to a pint or more at one time, is generally a prominent and important symptom of phthisis. It may be the first indication of approaching trouble. In the early stages it is usually a bronchial hæmorrhage, and though not serious in its immediate results, is prognostic of coming trouble, due to pulmonary weakness and laxity of tissue. In the later stages of the disease, it is a serious symptom, showing pulmonary destruction and ulcerative action in the walls of the blood-vessels. The rupture of a vessel of large size in the pulmonary tissues may cause speedy death from suffocation. The blood in these hæmorrhages is bright red and frothy, showing its pulmonary and arterial origin, and when they occur the patient usually

experiences a sense of trickling behind the breast-bone. Spitting of blood may result from many causes besides phthisis. For instance, the blood may come from the gums, from any part of the mouth, from the back of the nose, from the stomach, from the larynx, or it may be caused by what is known as atheromatous degeneration of the arteries. Some women habitually spit blood during their menstrual periods who have perfectly healthy lungs, and these cases must not be confounded with premonitory phthisical hæmorrhages.

Expectoration.—The matter expectorated during phthisis is quite characteristic. Most of it is produced by a coincident inflammation of the bronchial tubes in the immediate vicinity of the phthisical process. At first it is a scanty, transparent, viscid mucus. There are apt to be yellow spots and streaks in it when the smaller bronchial tubes become affected. When the air cells are implicated, parts of their lining membrane in a state of disintegration, and perhaps some blood

streaks will be found in it. With the process of softening, the phthisical products are expectorated in round, grayish masses. In fresh cavities they are thinner, with a rosy tinge. They sink in water, and may contain elastic tissue fibres, young cells, and lumps of cheesy and chalky matter, bacilli, and blood and pus globules. If dilatations in the bronchial tubes are present, the expectorated matter collected and detained in the cavities is apt to undergo fermentation, and becomes exceedingly offensive in odor, and may be expectorated in large amounts at one time.

Pains in the chest may be present at varying intervals during the affection. They are usually caused by inflammation in the pleura and in other parts surrounding the affected lung.

Fever.—This is probably the most important symptom in connection with phthisis. If this action is long continued, it hastens an unfavorable result. The temperature ranges from 100° to 107° F., being in proportion to the nature and ex-

tent of the affection. The patient is usually freer from fever in the morning. In the afternoon, after a state of chilliness, it increases, and then declining, is followed by a night sweat, usually very profuse. The sweat may be limited to a particular part of the body only, as for example, one half of the body. In such cases the other half of the body is liable to some other affection, such as neuralgia or nasal catarrh. The fever of phthisis is designated "hectic." It is probably the result of the irritation produced in the general tissues of the body by the degenerated phthisical products which have been absorbed by the system, the debilitated condition of the patient promoting the action. It occurs also in other conditions of debility, as in nursing women, and in cases where chronic abscesses produce a large amount of pus, etc. There are intermittent, remittent, and irregular types of the fever. When the sweats are very profuse they are exhaustive to the patient. They are probably due to relaxation of the muscles of

the vessels which supply the perspiratory glands. It is thought that they are somewhat beneficial in relieving the body of the impurities absorbed from the phthisical process, and in reducing the great and damaging heat of the febrile action. It is certain that after them the patient feels better for some hours. A regular thermometric observation of the phthisical patient is of great assistance in judging of the nature and rate of progress of the disease.

Accelerated pulse.—An increase in the pulse rate is an invariable accompaniment of the disease. The heart acts in an excitable and feeble manner, the pulse indicating from 100 to 140 beats per minute. As the fever increases the rapidity of the pulse is also increased.

Disordered digestion.—Unfortunately, in phthisis this is a more or less marked symptom. Exceptionally, the patient retains a good appetite throughout the course of the disease. In some cases, disorders of the digestion, due to various causes, bring about the affection. The

usual lack of appetite may even amount to repugnance for food, and the inability to digest not only leads to impaired nutrition of the various tissues, but the undigested food gives rise to irritative diarrhœa. Later in the disease, a catarrhal condition of the stomach is likely to be present, and is caused by the congestive tendencies of the poor circulation. Vomiting is often observed, and is mostly produced by paroxysms of coughing.

Emaciation.—Though not particularly diagnostic of phthisis, this symptom is always present to a greater or less degree at some time during the course of the affection, unless the course is very acute. The emaciation may precede the phthisis, being due to disorders of nutrition, but fever is the prominent cause of the noticeably rapid and extensive bodily waste.

Diarrhœa.—This is apt to occur in the later stages. It may be due to the presence of undigested food in the intestine, or to the irritation of the tubercular process in that organ. It is sometimes called "colliquative." When it is exces-

sive, the "hectic" is apt to be less. Towards the last, the feces may become dark brown and very offensive, and streaked with blood, the latter being produced from ulcerated surfaces.

Arrest of menstruation.—Among females this is an early symptom. It is due to a lack of nerve force, and to the derivative effect of the pulmonary irritation.

Change of voice.—If the larynx be implicated in the process, as is frequently the case, the voice takes on a peculiar husky tone. The inflammation and ulceration of the organ gives the patient great distress, the act of swallowing being so painful that it interferes with the taking of sufficient nourishment.

Œdema, or swelling of the feet and lower extremities, is a usual condition of the later stages of the malady. It is caused by the sluggish state of the circulation.

Enlargement of the ends of the fingers, as well as incurvation of the finger nails, is usually seen. The enlargement is

caused by an increase of the connective tissue of the ends of the fingers, brought about by impediment to the pulmonary circulation causing congestion in the parts. It is not peculiar to phthisis, being seen in heart troubles, etc. The incurvation of the nails is caused by the loss of the cushion of fat which normally pads the ends of the fingers.

Brain and abdominal symptoms occur when the tubercular process extends to those parts of the body, and are unfavorable signs.

The *characteristic* diagnostic *symptoms* of TUBERCULAR PHTHISIS are usually such as precede the physical signs in the lungs. They are as follows: The change in the voice, and other laryngeal symptoms; loss of flesh, strength, and appetite, with dyspeptic symptoms and fever; night sweats and hacking, dry cough. After these, expectoration and shortness of breath commence, and then shortly signs of solidification are to be observed in the lungs.

CATARRHAL PHTHISIS is characterized by first having local symptoms of bron-

chitis or pneumonia, while the general systemic symptoms only occur secondarily in gradually increasing progression.

FIBROID PHTHISIS is particularly marked by its very slow rate of progression. It has great chronicity, and the temperature is never very high, nor the pulse rapid. There are periods when the symptoms abate, and there are symptoms of chronic bronchitis present. In a very acute form of tuberculosis the general symptoms, previously stated, may be so pronounced as quite to mislead the physician, and may be so like the symptoms of typhoid fever as to be undistinguishable from it, especially as in this form the morning temperature may be higher than the afternoon.

Pregnancy interrupts the progress of the disease for the time being. The propagation of the species being the second great function of the individual (the first being that of self-preservation), when engaged in the work of gestation the first energies of the body are directed to this functional action. It is a well recog-

nized clinical observation that phthisical patients, when pregnant, cough less, spit less blood, and the general diseased process is retarded. But after the confinement, the disease makes up for the delay by an increased rate of progress. It is to be supposed that few medical men would advise the bearing of a phthisical child for the sake of retarding the phthisical process in the mother. However, there might be instances where great hereditary or property interests required and made allowable the extension of life in this way.

THE PHYSICAL SIGNS INDICATIVE OF PHTHISIS.

In medical parlance, a physical sign means a symptom which is perceptible to the senses of sight, touch, and hearing, and is to be distinguished from a symptom, which we recognize, through the reasoning powers, from the patient's relation of the unusual sensations experienced by them as the effects of the disease. As instances of the physical method of examination we may cite the following facts. We can *see* the movements of the chest, etc. We can *feel* the movements of the heart; the vibrations produced in the lungs by the voice, etc. We can *hear* variations in the sounds of the heart, the breathing, etc. This being so, it must be conceded that the method of observing disease by physical exploration is extremely valuable. The physical signs of phthisis, in conjunction with the symptoms described

in the previous chapter, are of great importance in diagnosticating the disease. In many cases either method alone would not give sufficient evidence to warrant the making of a diagnosis. It is usual to speak of phthisis as having three stages —a first stage of consolidation, a second of softening, and a third of excavation. Each of these stages furnish peculiar signs which are characteristic of it. However, there may be some cases where the first stage gives no physical sign of its occurrence. In inspecting or looking at a phthisical chest, there is usually found a restriction in its respiratory expansion, which is proportionate to the amount of pulmonary consolidation and the duration of the disease. Falling in of the chest walls occurs to a greater or lesser extent after the disease has made some progress, it either being due to the contraction of the fibrous connective tissue of the lungs or to loss of the lung substance itself. When the hand is held over the diseased lungs (for the malady usually occurs on one side only) and the patient counts or

coughs, there is more of a jar communicated to the hand over the affected part. However, even in health there would naturally be more of this vibration on the right side than on the left. A deficient expansion of the chest walls may often be more easily perceived by the hand, than by the sight. If there is a large cavity near the surface of the lung, the vibration of the voice, or of the gurgling of liquid in the cavity, may be detected by the sense of touch. If we tap with the end of the finger, or with an appropriately constructed small hammer, we may hear a comparative difference in the resonance between the healthy and the affected sides. A dull quality in the sound produced, proportionate to the amount of consolidation present, is usual, but this sign is often obscured by the presence of neighboring distended air cells, and by the intervention of healthy lung substance between the consolidated part and the chest wall. In the second and third stages the dulness becomes widespread and tubular in quality. If we strike or

percuss the chest *forcibly*, deep-seated dulness may be elicited. If there are cavities near the surface, a sort of "chink," known as the "cracked pot" sound, may be produced. If we listen with the ear at the chest walls, we may find in the first stage a weakness in, or even suppression of, the ordinary sounds of respiration at the affected point, and exaggerated respiratory sounds elsewhere. A prolonged, high-pitched respiratory sound may also be noticed. As the lung consolidates, the respiratory sound acquires a quality known as bronchial, and the heart-sounds become more intense over the affected part. During the course of the disease, the local bronchitis, which is usually present, produces an abnormal amount of mucus in the bronchial tubes, and the passage of the respired air through and over this fluid gives rise to crackling sounds of various kind, known as mucus rales. Over cavities may be heard gurgling and tinkling sounds, produced by air bubbling through, and of fluid dropping into the liquid contents of the cavi-

ty. The respiration may also sound like air being blown over the mouth of a bottle or through a cavern. Friction sounds are frequently heard, caused by the rubbing together of the inflamed pleural surfaces contiguous to the affected parts of the lung.

It is of the greatest importance in the treatment of phthisis that an *early* recognition of the diseased condition be made. The invasion of the malady is quiet and insidious, and early symptoms and signs are unfortunately likely to be overlooked or made light of, though nothing can be more fatal to the success of the treatment than such neglect. Among the important *early* signs to be recognized, are prolonged, high-pitched, jerky, or interrupted respiratory sounds, and high-pitched mucus rales, restricted to the upper part of one side of the chest. These signs, in combination with some of the symptoms described in the previous chapter, may give early warning of the phthisical process.

THE POSSIBILITIES OF CURING THE DISORDER.

PHTHISIS is without doubt a serious disease, and multitudes become its victims. Must therefore a person die whose lungs are affected by this disorder? Such a conclusion does not necessarily follow. Phthisis is a curable malady, if the conditions which surround the patient are fairly favorable, and the treatment be undertaken in time. Unfortunately for the majority of individuals who are afflicted with the affection, their lot in life is so hard that they cannot even command the conditions which are necessary to prevent the acquisition of the disorder, to say nothing of those necessary for curing it. When we speak of curing the disease, we mean the stoppage of its further progress; for, of course, the part of the lung which has been affected, is to all intents and purposes destroyed, and the individual is crippled to just the extent of

this destruction. The lungs are such important organs, that, if too much of the structure is destroyed, the life of the individual must cease; but if the part destroyed is only slight, its destruction may not interfere with the resumption of an actively useful life. Usually the lung is so much crippled that the individual has to somewhat restrict his life as to its activity, and be careful in his avoidance of various wearing, depressing and irritating influences, which would not interfere materially with the life of the possessor of a complete pair of healthy lungs. Many an individual lives a long life, during the greater part of which he has had only the use of one lung. Autopsies on the bodies of those who die of other diseases very frequently show that there has been old, but cured trouble, in the lungs examined. Catarrhal phthisis is less fatal than the tubercular variety, and patients with fibroid phthisis may live many years, and finally die from some other disease. A necessity to the cure of a case of phthisis is a strong will power, and

determination on the part of the patient to battle with the disease. It always is a hard battle, and sometimes a long one, before success can be claimed, and it requires patience and nerve to sustain the fight. But let it never be forgotten that PREVENTION in these cases is better than any amount of cure.

OTHER DISEASES WHICH MAY BE TAKEN FOR PHTHISIS.

THERE are a number of diseases and diseased conditions which present symptoms and signs so like those of phthisis, that they may be taken for it. For example: the spitting of blood is likely to cause great alarm to those in whom it occurs; but this expectorated blood may come from the back of the nose, from the gums, or mouth, or the larynx, or other parts of the air passages, or even from the stomach. Sometimes the function of menstruation takes on a vicarious action, and blood is expectorated for that reason. Chronic bronchitis may simulate phthisis so closely as to be hardly distinguishable. Indeed, a certain condition of chronic bronchitis may be, so far as its effects are concerned, just about the same thing as a fibroid phthisis. Typhoid fever, intermittent fever, pleurisy, pneumonia, and cancerous growths in the chest may

seem very much like some of the first stages of some of the varieties of phthisis, but generally a short course of observation, and the application of the tests which the knowledge of every trained physician enables him to apply, will make the distinction between the diseases obvious.

THE CAUSES OF PHTHISIS.

Of vastly greater importance to the patient than a knowledge of the nature of phthisis, is information as to the causative influences which are active in producing this serious disease; for it is only when a proper comprehension is attained of the numerous causes at work in its production, that an effectual rational treatment of the affection can be instituted. It is well at the start to put aside the idea of only one *specific* origin for the disease. It is certainly probable, that the introduction into the system of specific tubercular matter, such as the bacillus tuberculosis, may be *a* cause of the disease, but it is not by any means the *sole* cause. A phthisical action is no longer an entire mystery. It is due to general predisposing causes which are well understood, and to immediate irritations of which we know much. The proc-

esses of the disease are governed by general physical laws, and take on their peculiar character under the influences of the anatomical construction and physiological functions of the parts in which they occur. The causes, both *direct* and *indirect*, which act to bring about the peculiar diseased conditions of phthisis, are numerous. The great *predisposing* cause of phthisis is *malnutrition*, by which is meant, that a deficient supply of proper nutrient matter being furnished to the pulmonary and other structures, there is a deficient vital action on the part of the anatomical elements composing those structures, the result of which is that they lack firmness, density, toughness, and vital activity. Being in such a weak and delicate state, they are more sensitive to many irritating influences, and are not able to resist causes of disease which would produce no malign effects upon them if they were in a healthy condition. The causes which bring about states of malnutrition are almost too numerous to mention.

Congenital malformation of the bodily structure is a prominent one. In this condition, the digestive organs may not be sufficiently well constructed anatomically to carry on the processes of digestion and assimilation; or the nervous system may not have sufficient structural or functional development to generate and distribute the nervous energy necessary to carry on the functions of the various organs of the body with that rapidity and force essential to vigorous nutrition; or the heart may be too small and weak to propel the nutritive fluids properly; or the lungs may not be large enough for respiratory needs. With the latter class may be rated badly formed chests; as, for instance, those that are flat and contracted. Such badly formed chests prevent sufficient respiratory motion and functional activity of the pulmonary organs. In these cases the lungs are likely to be over used, and do not have sufficient rest to allow full repair to take place in them.

Another great predisposing cause of

phthisis is hereditary acquired habit. In a certain number of cases the hereditary tendency of the pulmonary structures to take on the phthisical action is so intense and fixed, by in-and-in breeding and by the habit of generations of phthisical ancestry, that, in a certain sense, it becomes a physiological act, and it is just as natural for some persons to become consumptive at some period of their lives, as it is for their noses to bud out on their faces, or for all animals to undergo senile degeneration towards the end of their lives. But more often the hereditary tendency requires some immediate exciting cause to start the disease into action. The general debility of parents, due to vicious habits of life, or to inheritance, may be handed down from one generation to another, and thus predispose to phthisis. A diseased habit may be acquired. Thus, a tendency of blood to accumulate in the lungs becomes a habit after a certain amount of exposure to such exciting causes as the frequent "taking of colds," inhalation of irritating

matters, etc. This habit may only require the conjunction of pulmonary malnutrition to start a phthisical action in the lungs. A habit that may be hereditary or acquired is slothfulness, which, if indulged in, must bring about a diseased condition in its possessor sooner or later. It will also be obvious that a vast variety of acquired habits would have a tendency to bring about a generally unhealthy and debilitated state of the body, in which state the lungs would offer a ready field of action for any special irritation causative of phthisis. Therefore, the following may be cited as among the predisposing causes of phthisis: in general, all depressing and debilitating influences; eating insufficient and badly selected food; intemperance in the use of alcoholics, and of the sexual function; lack of proper exercise and use of the muscular, nervous, and other systems; exhaustion from over-work, both of the brain and muscles; anxiety, unhappiness, and other mental disquietude; excitability of temperament, a peculiarity

resulting in a greater waste of the bodily structures than can be replaced during the periods of rest and by the nutrition supplied by the digestive system; deficient ventilation, and all contamination of the atmosphere with deleterious, irritating, or useless gases, which may be either absorbed into the blood, or irritate the pulmonary mucous membrane, or prevent a sufficient amount of oxygen being supplied to the blood, or prevent the proper excretion of the products of respiration; impropriety of, and inefficient dress; sedentary habits, especially when such habits follow over-development of the lungs. This latter is a frequent cause of phthisis in those who having been professional athletes, afterwards adopt sedentary lives. Defective drainage and lack of personal cleanliness may be predisposing causes of the disease; the excitements of fast living which are so frequently seen in the lives of fashionable people, especially in young women; previous debilitating disease; unhealthy occupations; depressing or too exciting

climates. These, with others, are all predisposing causes of phthisis.

It is probable that the beginning of catarrhal and fibroid cases of phthisis, if not of the tubercular type also, are marked by some congestive condition of the blood in the lungs, a condition in which there is an abnormal determination of the blood to the lungs. Possibly there is also a disturbance of the nervous supply distributed to the pulmonary organs. If this state of things occurs at some unfavorable time, when the pulmonary structures lack tone on account of being poorly nourished, they are not able to resist the influences that are brought to bear on them, and the diseased processes are then inaugurated.

There are a great number of conditions and influences which are certainly known to have so direct a relation to phthisis that they can be correctly called immediate *exciting causes* of the disease, most of them producing this abnormal congestive condition of the blood in the

lungs. The most generally prominent are climatic. These act deleteriously through unfavorable conditions of quick change and great range of temperature, or through the presence in the atmosphere of excessive moisture and irritating impurities. These conditions either produce direct bronchial and pulmonary irritation, or else act indirectly, by their effect on the surface of the body.

The causes just cited explain the production of some of the diseased conditions which are found in the phthisical lung, but they do not satisfactorily explain the causation of the tubercular formation. About four years ago a young German physician, by the name of Robert Koch, electrified the medical world by quietly announcing that he had found in the expectorated matter of phthisical patients, and in the tubercles themselves, a microscopically small organism, which has been called the Bacillus Tuberculosis. It was discovered by means of a peculiar method of coloring of, and microscopic examination of, the

tubercular matter. It has been inferred that this minute parasite is the specific cause of tubercular phthisis. This view is accepted by many prominent medical authorities, but has as yet not been absolutely proved to be correct. There is great probability, though, that it may be a correct theory, and it is the best hypothesis as to the cause of this affection ever brought forward. The bacillus is a very small oblong or staff-shaped body, equal in length to half the width of a red-blood corpuscle, and when the tubercle is examined under the microscope it is found scattered throughout its substance. It is almost always found in the phthisical tubercules, and has not been found in the product of any other disease. It may be placed in an artificial fluid or solid nutrient preparation, and there propagated and reproduced from generation to generation. These reproductions, if inoculated into the bodies of certain animals of tender structure—as, for example, the rabbit—will produce in them a disease which resembles that of

pulmonary phthisis in man. This matter, however, will not infect certain other animals; and a process which seems identical with the tubercular one can be produced in rabbits by inserting mechanical irritants, like bits of glass, etc., into their bodies. There are many facts, also, the results of ages of observation of the disease, which do not accord with this theory of the production of tubercular phthisis. However, it may be entirely possible that the entrance of this parasite into the human body, by way of the alimentary canal, or by the air passages, may be one, and a very frequent cause of the disease, the organisms being conveyed into the body by the food, or in the form of dust in the atmosphere breathed.

If this minute organism is the cause of the tubercular formation, the great majority of humanity is furnished with some protective influence against this insidious foe. If it were not so, as the bacillus, under this hypothesis, must be present almost everywhere, the human race would

soon become extinct. But it is contended that only a small part of the race is susceptible to its noxious action, that only which is reduced to this susceptible state through the malnutritive and other causes before cited. It is a well-known fact that some persons who are intimately brought into contact with phthisical patients acquire the disease. Notably is this the case with husband and wife. It must be noted, however, that medical men who attend clinics where the rooms are packed with phthisical patients, and who breathe air which must be laden with bacilli, and nurses who attend these patients in institutions, do not seem to be especially subject to the disease. For these, and other reasons, we are inclined to think that the cases which seem as though they were produced through contagion, by contact with a phthisical patient, are in reality caused by the direct influence of the mind on the local parts which become diseased. A continuous attention concentrated on the parts, and a belief by the individual that he is, or will become, phthisical, will

probably, under some circumstances, eventuate in the diseased process. This result is seen frequently in hypochondriacal patients, and is quite likely the inciting cause of most of those cases of so-called contagion, resulting from close continual contact with phthisical patients. We have no doubt that intense sympathy with a phthisical patient, coupled with a subsequent active imagination, has brought the disease to many an individual. However, it would be a wise provision in *all* cases, to see that the apartments of the patient are particularly well ventilated, that he occupies a bed separate from others, and that those who attend him should be careful to maintain their own health status at the very highest possible standard.

The following may also be noticed as exciting causes of one or another of the varieties of phthisis: the continuous inhalation of irritating gases and mechanical impurities, particularly of metallic and other dusts; the irritation of the pulmonary structures from impurities in the

blood; the blood congestive and obstructive tendencies of malarial fever and heart disease; imprudences during menstruation; the plugging up of a pulmonary blood-vessel of considerable size; a retained pulmonary or bronchial hæmorrhage. The disease very often follows measles, small-pox, and typhoid fever, bronchitis, pleurisy, and acute and chronic pneumonias or inflammations of the lungs. The age of the individual has not so much to do with the causation of the disease, as have the outside conditions which are liable to be coincident with the various stages of life. The greatest number die of phthisis between the ages of twenty and thirty years, an age when the duties, anxieties, and cares of life begin to press heavily upon the individual. Although the largest number of persons who die of the disease are about this age, it has been found that the *proportionate* death-rate among those who acquire it, increases progressively with advancing age. In other words, a person attacked by phthisis at twenty has a much better chance of

recovery than if he were sixty years of age. The causes producing phthisis will be further referred to in subsequent chapters, under various subjects there discussed.

THE GENERAL PRINCIPLES WHICH SHOULD GOVERN THE TREATMENT OF THE DISEASE.

Food. Air. Exercise.—These three words may be considered as representative of the most important principles concerned in the treatment of phthisis. It does not seem probable that any *specific* medicinal remedy for the cure of phthisis will ever be found, even if it be proved that the bacillus lately found in the diseased formations is the specific cause of the malady. The invasion of the disease is so insidious, that no warning of its coming is given. The enemy usually has a strong foothold before his presence is noticed. Even if such a remedy were found, it could hardly be expected that it would be continually taken by the large number of persons needing it, merely as a preventive measure. Furthermore, it is not probable that any medicament which would have a specific effect in destroy-

ing the parasite would be of much avail, for the reasons that anything taken internally which would destroy the bacillus, would probably also injure the normal structures of the body, and the diseased structures are so difficult of access, that local applications to effect such a purpose are almost entirely out of question. At any rate, all such procedures in the way of treatment have been of no avail, and we are compelled to combat the disease upon principles which relate to the building up and sustenance of the body on a high physical plane. *If the various structures of the body, including the lungs, are in a sufficiently healthy state, this disease cannot find a properly prepared soil in which to commenee its ravages, or, if already commenced, it can make no headway.*

Under these principles, and from what has been stated concerning the nature and causation of phthisis, it of course follows, that, if a person's ancestry and the individual himself live correctly, and avoid undue irritative exposure to the

productive causes, he will never have phthisis. It is very easy and simple to write this preventive formula, but it is one very difficult of execution in *any* case, and an impracticable proceeding to carry out, so far as it relates to the great majority of mankind, to whom, most unfortunately, the boons of proper food and pure air are denied by reason of the hard conditions which hedge in their existence. Fortunately for this large class of humanity, they are forced, by a seemingly hard but really kind necessity, to undertake as a preventive measure, that which is the greatest remedy against phthisis—WORK; or, in other words, exercise for the various structures of the body—muscular, nervous, and all the other systems. Among the comparatively few well-to-do individuals who can command, not only the luxuries and elegances of living, but also those hygienic necessities, proper food and pure air, it is usually the *lack* of being obliged to work with the muscular system for the means of subsistence, and ignorance of the physiological necessities

and benefits of work, which renders them an easy prey to disease, including phthisis.

The preventive treatment of phthisis should begin even at a pre-natal period. Phthisical individuals should not reproduce their kind, or if they do marry they should be particular to select very healthy mates. The fœtal existence should receive the best hygienic influences which the mother can give to her progeny during gestation. From birth to the end of life the individual must have food of proper quality, and in proper quantities, to thoroughly nourish all parts of his body, and to generate the amount of heat and energy necessary to the carrying out of a healthy existence. He must live in an atmosphere which is not only free from irritating and depressing influences, but it must also be one which is of such a tonic and sustaining nature that he will be able to live on a high physical plane under its influence. By means of exercise he must keep the various parts of his body up to their normally physiological

state, and must develop those parts which may be congenitally deficient. He must avoid all the varying, depressing, predisposing causes, as well as the particular exciting causes of the disease. Still, he must accustom himself to as great an amount of shock and irritation as his strength will withstand, and yet retain a good health status. The amount of wear and tear, general irritation and attrition, which will be for his good, must be a matter of individual experience; but it must be distinctly understood that the individual of phthisical tendency is not like a strong, healthy man, and that he cannot live the life of such a man if he expects to live a long one. His existence must be a somewhat restricted one. He is to be considered as the analogue of the tea-rose, the half-hardy plant, which attains its best conditions of growth and flowering capacity as a green-house plant. It will not do to treat it as a hot-house plant, nor, on the other hand, as the hardy wild rose. It is true that hardiness of constitution can be built up to a *certain extent*

in the phthisical person by years of careful living, but there will probably remain in him for life *some* delicacy of constitution. He must always be on his guard against excessive irritating and depressing causes. It must be remembered that there is no individual so congenitally physically perfect, but that some predisposing and directly irritative causes may be strong enough to bring about the phthisical process in him. It is a theoretical supposition, that a few generations of regulated breeding and living, would entirely banish phthisis from the race as a result of any of the ordinary irritative causes liable to be met with, in living out the cycle of human life; but until the millennium, it may be presumed that medical practitioners will see enough phthisical cases to make understanding the disease and its treatment a matter of great importance. Various minor but important matters relating to the prevention of phthisis will be considered further along, in connection with the subjects of dress, hygienic individual habits, healthfulness

of occupation, the construction and location of habitations, etc.

In the cure of phthisis, it may as well be recognized that in the majority of cases a number of favorable conditions surrounding the patient, as well as an early recognition and active treatment of the disease, are absolutely necessary if success is to be expected. Among these conditions, and a particularly necessary one, is that of a strong determination on the part of the patient to combat the disease. A few cases tend to self-cure, but only a few. The treatment is one of attention to a multitude of small matters. For instance, the wearing of slippers instead of warm shoes, may make all the difference between a cure and a fatal result.

In treating the trouble, the causes which have been at work in producing it, should be sought for and removed, as far as possible. Then the patient should be actively nourished by introducing into the system the necessary amount and quality of food required to build up and sustain healthy tissues, as quickly, continuously,

and extensively, as the combined capacity of the patient's digestive ability, the ingenuity, knowledge, and resources of the physician, cook, and larder will allow. The normal functional activity of the patient's tissues should be called forth through the tonic influences of breathing pure and invigorating air of the correct degree of moisture, gravity, and temperature, by proper exercise, change of scene, congenial occupation and cheerful surroundings. By so doing, it is expected that we can surround the morbid process with a pulmonary structure so firm, resisting, and well nourished, that the diseased action can make no headway into its substance by continuity or contiguity. This point gained, it is only a matter of time for the phthisical process already in action to run through its course of formation, softening, and excavation, and to terminate by self-limitation, leaving the seat of its action either fortunately intact or, as more frequently happens, a region whose functional uses are destroyed, the locality being fenced about

by more or less newly formed connective tissue, which eventually contracts.

The patient should avoid *all* sources of depression and irritation. Particularly should he dress properly. Furthermore, the aid of the pharmacopœia's tonic, sedative, and other remedies may be invoked, for the general help that they may frequently afford in correcting errors of nutrition, etc. Above all, it should be remembered that the stomach must be treated with gentleness and reverence. With a sound stomach there may be great hope for the patient, but with a disordered one, the chances are not nearly so good.

The more minute particulars of the *curative* treatment will be discussed in the following chapters.

RELATION OF MAN'S SURROUNDING CONDITIONS TO PHTHISIS.

Climate in its Relations to Phthisis.

ANY one skilled in pathological statistics, with isothermal chart and local meteorological tables before him, can map out with great accuracy and facility those localities which are the favorite abodes of phthisis, and indicate the proportionate death-rate from that disease, among the population of various localities. The state of the atmosphere has a most important bearing on the health of animals. Its barometric, thermometric, and hygrometric conditions, producing varying degrees of pressure, temperature, and amount of moisture, have a direct bearing on the most common functions of the animal economy. Race characteristics are largely formed through the influence of climate. The rigorous climate pro-

duces men of vigorous, quick action, while the mild and equable climate originates individuals whose characteristics are, like itself, lacking in energy. The ease of existence, which is a concomitant of the moderate climate, induces a certain slowness and slothfulness of life. People habituated to a certain climate find it a difficult matter to become accustomed to a new order of things in a different locality and latitude. Changeability of climate is one of the causative influences producing phthisis.

Variation in climate depends upon solar declension or season, altitude, latitude, local character of soils and surroundings, amount of rain-fall, and the physical character of the country, such as the presence or absence of bodies or streams of water and mountains and plains. Furthermore, the existence of forests, which tend to equalize temperature and moisture, the cultivation of the soil, the presence of towns and manufacturing establishments, and the density of population are all factors which qualify the nature of

a climate, and are to be taken into consideration in estimating its value in relation to phthisis, either as a causative influence, or in the preventive and curative treatment of the disease. Phthisis is found in all climates, but its home and favorite locality is in the temperate zone, that inappropriately named region, where extremes of temperature—great cold and excessive heat, free atmospheric moisture and considerable atmospheric impurity—are found. It is infrequently found in latitudes where the temperature does not fall much below that of the human body, and also in climates so cold that atmospheric moisture is only present in very small amount. The climate most favorable to its production, is that in which quick and extensive temperature changes occur, in which there is a maximum amount of moisture, and where great atmospheric impurities and miasmatic influences abound.

The most important consideration in the estimation of a climate in connection with its relation to phthisis, is its fitness,

as a means in the treatment of phthisical invalids. Next to the investigation of the alimentary conditions and habits of the patient, inquiry as to his climatic surroundings is in order. Is the climate exerting an irritating or depressing or too exciting an influence on the patient? or is there too great or too little atmospheric pressure? or is its heat or moisture unfavorable to him? A correct decision as to these points is of great importance in the treatment. The desirable conditions which should be sought for in a change of climate for the phthisical invalid are as follows: *First*, purity of atmosphere. *Second*, a barometric pressure which best conduces to the functional activity of the patient's respiration and heart action. *Third*, a ratio of moisture present which will be most desirable for the peculiarities of the individual. *Fourth*, equality of temperature. *Fifth*, absence of high winds. It will be observed that all of these qualities are negative influences. A "bracing" climate is merely one in which depressing influences are ab-

sent. The stimulus which comes from a change of scene is not to be confounded with climatic effect. We are inclined to think that when the patient makes a climatic change, he usually imagines that he is to receive some mysterious panacea from the atmosphere. With this idea he goes to some comfortless spot, away from friends and home comforts, where he can get very little to eat suitable to his condition, and relying upon the climate to effect his physical regeneration; he is likely to neglect many of those hygienic habits which he should adopt and practice. Naturally, such a patient does not improve much when he goes away from home for the benefit of his health. By removal from an impure, contaminated, or depressing atmosphere, or an irregular climate, to a suitable locality, chances of irritation or depression from those causes are removed, and the transpiratory processes occurring in the lungs are more completely and effectively brought about.

Selection of climate with regard to atmospheric pressure and moisture must

be made to suit the individual needs and peculiarities of the patient; no definite rule can be laid down. The patient must search for, and personally test, the various climates for himself. The atmospheric pressure, etc., which allows of easy respiration and proper determination of blood to the pulmonary structures, is not the same for different individuals. A great deal depends upon the nature of the patient's disorder and temperament. For example, a phlegmatic person may need a more stimulating climate, while an excitable one may require a soothing one. We are inclined to think, that if there be equality of temperature, a correct amount of moisture present in the atmosphere, and freedom from impurities, the lower the altitude, with its greater atmospheric pressure, the more beneficial it will usually be found for the phthisical patient. However, good authority asserts that from one to two thousand feet of elevation above tide water is beneficial for the average case. It is certain that the higher the elevation of the place of

abode, the greater the tendency is to pulmonary congestion and consequent hæmorrhage. We also find that in the more rarefied atmosphere greater pulmonary motion is required in the oxygenation of a certain amount of blood; and in phthisis the less pulmonary movement made by the patient in the aëration of his blood, the better. As a practical thing, we seldom find purity and dryness of atmosphere and equality of temperature except at high elevations. The amount of atmospheric moisture most beneficial to the phthisical patient also varies in individual cases. If there is a coincident bronchitis present, with a free secretion of mucus, then a dry climate is usually best; but in some cases moist climates are serviceable. An important point to take into consideration in selecting a climate for the phthisical is that of equality in temperature. Sudden great thermometric change is, as every one knows, deleterious even to strong individuals; and it is even more so to the delicate invalid, who is more sensitive to these ex-

ternal influences. The undesirable effect may be due to the reflex irritating action on the pulmonary and other organs, following the effect on the skin of the sudden change of temperature. Furthermore, chilling the surfaces of the body drives the blood away from the exterior, and congests the internal organs, especially the weak, diseased ones. However, in *prevention* of phthisis, *too* equable a climate is not the ideal. A certain amount of shock resulting from change of temperature is necessary to the building up and continuation of a healthy constitution. Perhaps the most important characteristic of a climate, from a phthisical point of view, is its adaptability to a continuous out-of-door life. This brings us to the subject of winter climates for the phthisical. We have to admit here, that we have no *entirely* satisfactory winter climate for such cases on the Atlantic side of the North American continent. The writer's opinion is the result of a rather extended personal observation of our country east of the Mississippi

River. For those to whom dry air is beneficial, and who have sufficient vital force and activity to keep up vigorous, continuous exercise, there are many dry, *cold* regions in our northern country which would prove desirable; but the greater number of phthisical patients have not this power, and for them, if they are to live the out-of-door life which will give them the greatest amount of atmospheric purity, with the beneficial stimulating effects of direct sunlight and active exercise, they must have a higher temperature to effect the conservation of their vital forces. Outside of this, other things being equal, the breathing of very cold air has an injurious effect upon very delicate pulmonary organs by reducing their vitality The great trouble with the best of our climates is, that they are to be enjoyed only with the disadvantages of a deficient supply of proper food, of deprivation of friends and home comforts, and of the lack of surroundings which might interest and occupy the attention of the invalid. These drawbacks espe-

cially apply to females. Dr. Alonzo Clark is the originator of the following aphorism, "Men and dogs may live in the fields, but women and cats require a home." The truth therein expressed will be generally conceded. This being the case, it chances that when a change of climate is desirable, the physician is forced to send the patient to some locality which perhaps is not otherwise the best for him. Unless the patient will live out of doors, or if he is unhappy because of the lack of interesting and comfortable surroundings, or because of homesickness, it is undoubtedly better for him to stay at home. The winter atmosphere in the rooms of a well built, well lighted, well ventilated and well heated Northern home, contains nothing positively bad, and only lacks the incentive to active exercise, and the mental stimulation which comes with the freedom and sights of out-of-door life. In view of this deficiency of available winter climates, it is yearly becoming more obvious that the *summer* climatic treatment

of phthisis is not only the most feasible method, but should never be neglected. As winter is a disagreeable season all the world over, so is summer equally characterized by its desirable qualities, and our Northern and Middle States abound in numberless localities where the summer climate offers all the practical advantages for the treatment of phthisis that could be expected. Physically considered, he must be a very worthless individual who, if he be given the opportunity, cannot attain during our Northern summer, sufficient physical stamina to tide through the inclement colder season, with its various irritating and depressing influences. Of course it must be distinctly understood, that the very finest of climates will not support and maintain in health any one, unless he calls to his aid the necessary adjuncts of correct nourishment, the vigorous functional action of the various organs of his body, and the application of ordinary hygienic prudence and caution as to the minutiæ of his daily life. (For the location of favorable

climates, see "Locality in its Relations to Phthisis.")

The Atmosphere in its Relation to Phthisis.

Man lives at the bottom of a vast ocean of diluted nutritive matter, which surrounds the earth to the depth of some twenty miles, and which is known as the atmosphere. This gaseous ocean has weight, and owing to the attraction of gravitation, and the molecular mobility of the elements of which air is composed, it exerts in every direction a continuous pressure. This pressure varies at different altitudes, and owing to various atmospheric and solar influences, varies from time to time in the same place. Owing to this fact, considerable difference in respiratory effort is necessarily made in different locations, and at times of varying pressure. Furthermore, ease of circulatory action in the various parts of the body, especially in the lungs, is somewhat regulated by this physical cause. The less the pressure, the more readily does the heart fill the minute blood-

vessels of the lungs. If a change of atmospheric pressure in an individual case, is a requirement, as it often is, it may be advantageously gained by the patient's locating at some altitude that will fulfil the requirement. The nutritive matter in the atmosphere available to man is oxygen, a most active gas, which composes one fifth part of the atmosphere, most of the remainder being formed of nitrogen, a passive, inert gas, and thus an excellent diluent. The oxygen has a chemical affinity for a vast number of elementary and compound substances, and, among others, the principal organic elements which enter into the composition of those elementary substances used as food, and with the tissues of the body themselves. Being absorbed by the various parts of the body from the blood, or directly from the atmosphere through the skin, it enters into active chemical union with the various matters found in the parts, and in so doing gives rise to the heat and force necessary to vital action. The atmosphere further contains watery

vapor in varying amounts, a small percentage of carbonic acid gas, of nitrogen compounds, of various impurities in the shape of floating dust disintegrated from organic and mineral matters, and of innumerable microscopic, animal, vegetable, and disease germs. So far as man is concerned, probably his best condition would be conserved if the atmospheric contents were composed of but the two elements, oxygen and nitrogen, with the presence of a moderate amount of moisture. If the proportion of oxygen be even slightly reduced, his health suffers. If it be reduced ten per cent, he dies almost immediately, on account of the deficiency. If the percentage of carbonic acid gas and other impurities be increased, he also suffers. He cannot live if carbonic acid gas is present in the atmosphere in amount equal to one quarter of the atmospheric bulk, as the accumulation of the gas in the system prevents the absorption of the necessary amount of oxygen, and first producing insensibility, finally depresses the nerve centres, and thus causes death.

Atmospheric impurities have a very important effect in the production and continuation of phthisis. This result may come from the absorption into the system of depressing or irritating gaseous impurities, of disease principles, particularly of the bacillus tuberculosis, which is now claimed to be the specific cause of phthisis; from the inhalation of matters which lodge in the pulmonary air tubes and vesicles, and by their mere presence on the lining membrane of those organs, or by absolutely working into the texture of the pulmonary tissues, set up an irritative diseased process. These irritants may be fine particles of metal, such as are produced by steel grinders, and also of coal and other dust. So much being accepted, it must obviously be conceded that the breathing of fresh, clean air is a prime necessity for the phthisical patient in the treatment of the disease. The following are among the more common causes producing atmospheric contamination. Bad ventilation; overcrowding in habitations and assemblages;

the gaseous and other emanations from water-closets, sinks, drains, sewers, stables, and street and road dust; the products of combustion given off by manufactories, and by heating and cooking apparatuses; the defective cleanliness of roads, streets, and private premises; and all fermentative and manufacturing processes. Indoors, the impurities may come from decaying matter in the cellar; from overheated and badly constructed stoves; from artificial lights; from the emanations of the cooking process; from unclean utensils, and the emanations from sick and uncleanly persons; and from normal respiratory excretion. The dwelling-place of the phthisical patient should be selected with a view to avoiding these sources of atmospheric impurity. If the patient should be confined to his room there should be only enough artificial light present to make it cheerful; and too many persons should not be in the room, on account of the resulting contamination of the air. The presence of carpets, curtains, and other fabrics, especially of wool,

should be dispensed with to as great an extent as possible, because they absorb and retain organic impurities. Excessive growth of hair and beard should also not be allowed for the same reason. The presence of salt in the atmosphere may be regarded as an impurity, except in those localities where it is constantly present. Even in such instances it may act as a pulmonary irritant; and along the sea-coast and shores of extensive salt-water inlets, where alternate land and water breezes prevail, the remittent presence of salt in the air, acts seriously as a direct irritant to the lining membrane of the pulmonary air spaces, and is thus one of the causes at work in producing phthisis, and in preventing its cure.

Heat and Cold in Relation to Phthisis.

The human body is composed of a vast aggregation of cell elements. These are minute microscopic masses of protoplasm, a substance always present where the vital phenomenon known as life, is observed. Protoplasm, as seen in different

organisms, always requires a certain degree of heat at which it manifests its highest functional activity. This temperature varies in different organisms, but in man it is about 98° F. As this degree of heat is lessened, the functional activity of the anatomical cell elements of the body declines, and at about 90° F. ceases. If the degree of heat be increased to about 110° F., the protoplasmic function also comes to an end. It is due to this fact, that the application and abstraction of heat diminishes, and in excess, abrogates nervous sensation in the human body; and on this account both extreme heat and cold have a prejudicial effect on man. The average atmospheric temperature being considerably below that of the human body, to keep up the degree of heat necessary to carry on life, there is provided in the body a continuous chemical action in the various tissues, and the frictional action of the blood coursing through the blood-vessels and of the movements of the anatomical elements in the body. This latter cellular friction

may be excessive in the absence of diffused fatty matter in the tissues. Fat acts, in a manner, as a lubricator in the various tissue movements. It is quite probable that the lack of fat in the pulmonary structures may result in an excessive amount of friction in the anatomical elements, and thus tend to excite phthisical action. Heat and cold have direct relations to phthisis in various ways. For example, excess or lack of heat regulates in a measure soil decomposition and the production of alimentary products, thus determining the nature and quantity of the food supply of the inhabitants of particular localities. Heat induces various decomposition processes, both of vegetable and animal matters, which result in atmospheric contamination. Furthermore, a high degree of heat renders the atmosphere dry, and thus increases its capability of absorbing and diffusing watery vapor. A great degree of cold also renders the atmosphere dry, by condensing and congealing its moisture. A certain amount of temperature

change from heat to cold, and vice versa, conduces to vigorous vital action in man by its tonic effect. This effect is a reflex action on the internal organs of the body, originating from the sensation of heat and cold on the external surfaces. Cold of a certain degree has a beneficial effect, by contracting the minute blood-vessels on the surface of the body, pressing the blood out of them, and increasing the blood supply to the important internal organs, thus bringing about better and quicker general nutrition. This beneficial action may be easily overdone, thus producing the diseased action commonly known as "taking cold." The exposure of the large expanse of pulmonary membrane lining the air cavities to the cold air inhaled, tends to reduce the bodily heat, but this effect is counteracted by the increased vital action of the oxidation processes at that point, and the reflex quickening of the action of the internal organs. This reaction is the tonic effect of cold, and unless it occurs in response to exposure to cold, the result is deleterious:

hence, for those delicate phthisical invalids who have a deficient responsive vital power, very cold climates are depressing and injurious. On the other hand, heat represses the oxidation processes, is conservative of bodily heat, and sustains the respiratory function. Therefore those delicate invalids are more comfortable in, and are most benefited by, the warmer climates. There is a considerable amount of idiosyncrasy observed among patients as to the degree of heat which is best for them. Perhaps the average atmospheric temperature in which the best muscular efforts can be made, is at about 60° F., and the most generally agreeable temperature to rest in, is at about 70° F. During sleep, a somewhat lower temperature is desirable, as conducing to a quieting effect in producing restful sleep. While a certain diversity of temperature is desirable in the daily life of those who would avoid phthisis; in those in whom the diseased action is commenced, equality of temperature is greatly to be desired, for then it becomes important to

avoid every excitation of the diseased parts, either by direct or reflex action. Rather, on the other hand, should such measures be instituted as will have a derivative effect, in directing away from the affected parts any excessive circulatory or nervous action, and in soothing the over-excited parts. Perhaps the atmospheric temperature which is most destructive to the phthisical patient, and most provocative in causing the disease, is at about the freezing point; for at this temperature, the atmosphere is most capable of being loaded with perceptible moisture, and on this account, and on that of the depressing influence of this degree of cold, there is the most marked injurious effect upon the pulmonary organs. When the temperature ranges much below this point, the watery vapor of the atmosphere is congealed, and the air being thus dried, gains non-conductive properties which reduces its effect on either the external surfaces of the body, or on the lining membrane of the pulmonary air cavities. Of course reference is made to ordinary

temperatures. When an *intense* degree of atmospheric cold prevails, its effect on the pulmonary tissues, results in a condition of depression, pain, shock and subsequent irritation.

Moisture in its Relations to Phthisis.

Water in some form is universally diffused over our globe. It is in the rocks and soil. All organized bodies are largely composed of it, and, as a matter of importance to our subject, it is always in the atmosphere, in varying proportions. Water is a universal solvent, and largely determines in matter the properties of hardness, density and mobility. Without it there would be scarcely any motion on our planet. Water is the largest single element entering into the composition of the human body. If it is not taken in proper quantity, the nutritive processes may be decidedly interfered with, producing diseased conditions. The regulation of the quantity of water used, may be an important point in the correction of errors of nutrition in the phthisical pa-

tient. We are inclined to think that the drinking of such excessive quantities of milk, or other fluids, as is frequently recommended, must have a prejudicial effect in those phthisical cases in which there is already an unnatural thinness of the blood. It is questionable whether any advantage can be gained in over-distension of the blood-vessels with poor blood, especially in those cases where hæmorrhages are a frequent symptom of the disease. But it is true that the arterial pressure should be kept up by drinking a sufficient supply of water to thoroughly fill the blood-vessels. Perhaps the most important characteristic of an atmosphere to the consumptive, is the amount of moisture which it contains. A certain amount of moisture in the atmosphere is absolutely indispensable to health and to life itself. The amount best adapted to individual needs varies, which we have already seen is the case with atmospheric pressure and temperature. Atmospheric moisture acts in preventing an excessive drying effect of the surfaces of the body.

It also gives the air, conducting properties, and thus tends to carry off the surplus heat generated in the body. Other conditions being equal, phthisis is always found to preponderate in proportion to the presence of an excess of atmospheric moisture. When it is present in excess, it is undoubtedly a prominent cause in the production of the disease. An excessive amount of atmospheric moisture has its prejudicial effect in this way. In proportion to the amount present, it renders the air a quick conductor of heat, and thus, through close contact with moist air, the individual is subject to a quick deprivation of his bodily heat. Such deprivation is liable to cause chill, reflex action, depression of the vital activities, and disturbances of the vascular system, that is, of the blood supply. These disturbances, acting through the agency of the nervous system, deprive some of the tissues of sufficient blood, and give an excessive supply to others, both of which results are undesirable. Excessive atmospheric moisture acts also in preventing active excretion

through the avenues of the skin and pulmonary organs, and in cases of high temperature and high degrees of atmospheric watery saturation, the evaporation of perspiration is retarded, and thus a proper escape of bodily heat is prevented. This last condition is particularly depressing to the general system. The capacity of the atmosphere for absorbing watery vapor increases with the elevation of temperature, and from this cause and others, the amount of vapor in the atmosphere is constantly varying. With air rated at 1000, and water at 1, as a means of comparison, air at 32° F. will take up moisture at the rate of 5.69 per cent, and at 60° F. 14.108 per cent. The amount of moisture present in the atmosphere of a certain locality, depends upon the texture of the soil, the surface drainage, the vicinity of bodies of water or streams, and the direction of the winds, some being dry while others are universally wet. Solar declension is the most important factor at work in deciding the presence of free moisture. The more directly the

sun's rays strike the atmosphere, the more is heat absorbed, in consequence of which the atmosphere becomes dried through its increased capability of taking up the free moisture present. Atmospheric moisture tends to equalize the temperatures of a locality. In dry countries, the daily variation of temperatures is extreme. Water is the greatest known absorber of heat, and the watery vapor of the air absorbs it from the sun's rays in large amounts, holding it, and only gradually giving it off. In dry countries, the direct rays of the sun during the day are very hot, little moisture being interposed to absorb the heat rays, while as soon as the sun's rays are hidden at sundown, the atmospheric temperature falls very quickly, and the night temperature will be found to vary greatly from that of the day. This fact may be sufficient to interdict the phthisical invalid from residing in a locality where otherwise the dryness and other characteristics of the atmosphere would be beneficial. In this matter, as in many others, moderation should

be the rule. The amount of moisture present in the atmosphere should neither be too great nor too little.

Light in its Relations to Phthisis.

Science has very little to offer in explanation of the undoubtedly correct clinical observation, that light has an important bearing on our subject. Light is a complex manifestation of heat, chemical action, and illumination. The relation of the heat property of light to our subject, is not difficult to understand, and has been already commented upon; but the process by which the chemical and illuminating properties of light subserve the purposes of animal nutrition and growth, is left for future scientific revelation. Perhaps, in man, the illuminating properties affect his general health through the functions of the eye. If that organ is not used it becomes diseased; as the visual nerve centres have very intimate and direct connection with the various bodily organs, which are only accustomed to respond functionally to

primary visual action, it is not difficult to appreciate that lack of light, depriving the optical apparatus of its function, would also indirectly have a depressing and deteriorating effect upon the whole body. However this may be, we know as the result of practical extended observation, that neither plants nor animals retain their health if deprived of light. Certain animals, such as rabbits, become phthisical if confined in a dark, damp, cold place for a few weeks. The old experiment of utilizing the Mammoth Cave as a residence for consumptives was a failure, principally on account of the deprivation of light. Not only is it desirable for the phthisical person to expose himself as much as possible to direct sunlight, both as a preventive and curative influence, but his dwelling should be so arranged that the sun's direct rays can penetrate as much as possible into his living rooms, and the fading of carpets, curtains and furniture, should not be allowed to interfere with this hygienic provision. Very often a dwelling is

made unhealthy by being shaded with trees, which not only deprive it of light, but also keep it damp and cold. It is a matter of great moment to build a dwelling in such shape and position, that the direct sunlight may have full opportunity to shine into every room. We have yet to see a winter hotel for invalids so constructed as to possess this advantage. In such a structure, its greatest length should be from east to west, so that it should face the south, and consequently receive the sunlight all day. All the apartments for invalids should be on the southern face of the building, and there should be no obstacles, such as porches or wings, to intercept the direct sunlight. The halls may be at the back of the building, but no sleeping or other rooms intended for the invalid guests, should be constructed on the sunless side. In our northern climate, a hygienic dwelling intended for an all-the-year-round residence, should be built so as to approximate in form to an oblong rectangle, with its greatest length from north to

south. There may be deciduous shade trees planted at the narrow southern end of the house, to protect it from the scorching rays of the summer sun at mid-day, and evergreens on its northern side to protect it from severe, cold, harsh winds; but the eastern and western sides should be left open to the direct morning and afternoon sunlight. With windows properly located, all the rooms of such a house would receive more or less direct sunlight during some portion of the day.

The stimulating and beneficial effect of the sun-bath is now well recognized. It would be hardly practicable for the delicate consumptive to indulge in this luxury, but as a preventive measure it might be of considerable value. In childhood a race on a sandy beach in a *bare skin* bathing suit, followed by a short dip in the water, has a splendid stimulating tonic effect. The blue glass craze has gone out of fashion; it was a good mania in its way; not that the refractive and reflective qualities of the blue glass gave the transmitted light any peculiar

virtues, but because exposure to sunlight of any degree, for certain patients, is a good influence, and by transmitting pure sunlight through a blue medium, some of the heat and illuminating rays are absorbed, and thus a patient might advantageously expose himself to the chemical rays, when otherwise the undivided ray might be disagreeable, on account of undue heat and glare. The phthisical patient should be in the bright sunlight as much as possible, and one of the objects in sending such a person to a mild climate, is that he may receive the benefit of this beneficent influence by living most of his time out of doors.

Locality and Soils in their Relation to Phthisis.

As we have stated that certain conditions of atmospheric temperature, pressure, moisture, and purity, together with the influence of light, are essentials in the treatment of phthisis, it is in order to show where these conditions may be found, or in other words, to indicate the locations where the phthisical individual

should reside. Individual need must again be the test in the selection of such localities. A close inspection of the proposed dwelling and its immediate surroundings should never be neglected. A certain region may, in general, furnish all the requirements sought for, but the particular position of the proposed dwelling may annul all the general virtues of the region, on account of some local defect. For example: the habitation may be in some small valley where dampness and cold air settles, while on a hill or plain at a little distance, equality, mildness, and dryness of atmosphere may exist. The near presence of a small brook, pond, marsh, or sewage-soaked soil, and consequently polluted water-supply, might make that particular locality undesirable. A very common objection to some locations is the impossibility of procuring proper food for the patient. Phthisical persons should, if possible, always locate in the neighborhood of a good milk supply. A most important point is, that the surroundings should be

of such a character that the patient should find occupation of some kind, or amusement of an interesting and agreeable nature. If a locality has a mentally depressing influence on the patient, it is no place for him, no matter what its other virtues may be.

The main points to avoid in selecting a locality are uninteresting surroundings, lack of proper food, excess of moisture, impurity of air and malarial influence, extremes and changeability of temperature, and high winds. The local soil should always be observed. It should be naturally well drained, and if not sufficiently porous, should have enough inclination of surface to allow water to flow off readily. All localities have a sub-soil water level, and the ideal locality should have this water level at a considerable depth. A glance at the wells of a neighborhood will throw light on this point. It is obvious that a tenacious soil, which either holds water in depressions, or which is level and has no under-drainage, is not the location for the phthisical pa-

tient. But where are the best locations to be found? There are some regions so benign in their climatic influences that "colds" are not even known. Egypt, India, Lower California, etc. are examples; but such favored localities are few and far away. However, there are many places here and there, where a reasonable number of the necessary requirements and conditions can be found. The location nearest to New York City fulfilling such requirements, is the neighborhood of Morristown, N. J. This place is situated on an extensive gravel formation, has an elevation of three hundred feet above tide water, and we doubt if there is a much better locality for an all-the-year residence for an individual of phthisical tendency. All Northern New Jersey twenty-five miles west of the seacoast, has a generally good climate, and many favorable localities, as have some parts of Southern New Jersey, as, for example, Lakewood; also Western and Central New York west of the Hudson River, whose valley is as damp, depress-

ing, and malarious as it is beautiful. The Adirondack region is a fine one. It has considerable elevation, and presents unusual attractions for those who love nature, and affords excellent opportunities for the sportsman to indulge his longings. The hill countries of Vermont, New Hampshire, and Western Massachusetts have good summer climates. The little town of Gilmanton, Belknap Co., N. H., situated at an elevation of eleven hundred feet above the sea, enjoys a climate during the months of July and August, as nearly perfect as can be expected on this earth. It is exceptionally favored as to drainage, location, and surroundings, and the purity of air found there is remarkable. Eastern Massachusetts, and the country bordering the easterly seacoast and Long Island Sound, do not afford a favorable climate for the average consumptive. Most of the prevailing winds are moist, and there is much atmospheric harshness, even during the most favorable months of the year. Western North Carolina, Northern Georgia and

Eastern Tennessee afford very desirable climatic conditions during the spring and fall. The high elevation of the land, together with the fine scenery and purity of air, are the prominent advantages of those localities. Most of our Southern towns of large size are unfortunate in their locations and surroundings, and we know of none which present advantageous climatic conditions. The locality which has the finest winter climate to be found in our Southern States, is along the swell of pine woodland which commences about fifty miles south of Macon, Ga., and runs into North-Western Florida, the tract having an elevation of from three hundred to five hundred feet above the sea. Some small towns, such as Eastman and Thomasville, are springing up in that region, and are gaining fame as health resorts. Aiken, near Augusta, is located on a sandy tract of pine land, and has a somewhat similar climate, but is more subject to cold storms. The other locality is milder, and has a singularly balmy atmosphere. The region

though, has its rivers and swampy spots which should be avoided, and the thermometer occasionally runs down below the freezing point. The great drawback of the region is its lack of local attractions in the way of scenery, etc. There are pine forests, turpentine stills, sawmills, and also an occasional agricultural attempt ; but the above mentioned attractions are not likely to be of great interest to the average individual. On this account we are frequently obliged to select Florida as the most available winter resort for the phthisical invalid, within a reasonable distance from New York City ; it is also comparatively easy of access. All Eastern Florida is damp and has a changeable climate, but it presents points of interest so greatly superior to those of other localities, and its latitude gives it such climatic mildness, that it is to be preferred to many other localities as a winter resort. Its water attractions, both of river and ocean, its orange groves and semi-tropical vegetation, and the large number of its visitors, a small

part only of whom are invalids, give the locality interest and liveliness.

If an immediate change of climate and scene is regarded as imperative, and in phthisis delay in treatment is to be avoided, it would be well to spend the fall or spring in the uplands of the interior of the South, the winter in Florida, and the summer at some appropriate place in the Northern States. If pecuniary, or other circumstances, preclude other than a short trip southward, it should be taken in the spring, and so late that the return home will not be made until the weather has become settled and warm. Southern California and New Mexico are spoken of most favorably as beneficial resorts for consumptives. Minnesota and Colorado are the Meccas to which many phthisical pilgrims wend their way, the elevated country affording the dry, pure and bracing air which is the panacea, giving at least, palliation in a certain number of cases. As to Colorado, patients who go there usually die of the disease if they stay

long enough. Estimated as to its climate, it is probably desirable for a short visit, especially in the beautiful summer season which invites such active out-of-door exercise as must be taken in hunting, mountain exploration, etc. Owing to the thinness and dryness of the air, there are very trying extremes between the day and the night temperatures. It is said that the purity of the air is somewhat tainted in this day, by the many coal fires of Denver, and that the bad sewerage and dust of that town, give it a very undesirable atmosphere. Of all the localities known to us, where we would send a patient with incipient phthisis for the six winter months, we should prefer the Bermuda Islands. The temperature of these islands is remarkably equable, being only surpassed by that of the Madeiras; the whole yearly range never being beyond 40° F. and the daily variation does not exceed 5° F. Besides this wonderful equality of temperature, there is more to see of natural beauty, and of man's work, that would be of interest to the average

individual, than can well be found in the same extent of territory anywhere within the same distance from New York. The winter climate is a *cool* one, and *too boisterous* for a delicate invalid. The average winter temperature is 60° F., which makes possible a continuous out-of-door life, in which abundant sources of occupation and amusement can be found. The atmosphere though always moist, is pure and equable in temperature, and the wind though blowing continually, will impart health to almost any one not too far advanced in phthisis. If the disease has made much progress, the climate is too exciting, and the disease makes rapid, unfavorable progress. The greatest objection to the Bermudas as a place of winter resort, is the lively shaking which the passenger has to experience on the small steamer in its trip across the Gulf Stream.

The Bahamas and other islands to the southward, afford a warmer, but less equable climate, and may be utilized by more delicate patients who desire a

change from other visited localities. Parts of Australia, and the Sandwich Islands, are frequently lauded as sanitariums of great virtue for phthisical patients.

In Europe Heiden, Gais, Weissbad, Kreuth, etc., are recommended as summer resorts; Soden, Badenweiler, Wiesbaden, and Lake Geneva as fall resorts; and Mizza, Mentone, Pau, Nice, Algiers, Cairo, and the Madeiras, etc., as winter resorts for the phthisical patient. Too long a residence in one locality is generally not desirable. Change of scene and company, and the stimulus of moderate climatic change are all beneficial.

Food in its Relations to Phthisis.

In considering the treatment of phthisis, the most important part of the subject, by far, is that which relates to the food supply of the patient. Starvation has probably more to do in the production of phthisis than any other individual cause. The proper regulation of the patient's food supply, is the fundamental

means of effecting the cure of the disease. By starvation, we mean the deprivation of *proper* food, both as to the quantity and quality, required for healthy nutrition. We should call the diet of fried food, pie and unlimited tea, indulged in by so many of the inhabitants of our Northern States, starvation.

By food, is generally meant all those matters which serve in the building up and sustentation of the tissues of the body. In its broadest sense, this includes oxygen, but as this element does not enter the system by the alimentary canal to any great extent, it need not be considered in this part of the subject. With the exception of oxygen, man's food is composed of a variety of complex substances, mostly of animal or vegetable origin. Besides water, considerable inorganic mineral matter is used as food in the form of common salt, and in other forms that may be in solution in drinking water. By proper selection, it is probable that man could receive all the necessary nutritive matters, excluding oxygen, from

the products of the animal and vegetable kingdoms. Physiologically considered, the elements which are found to be necessary to the maintenance of the nutrition of the body are oxygen; water; the mineral salts, which include sodium chloride, potassium chloride, potassium phosphate, sodium sulphate; the carbohydrates, which include the starches, sugars and fats; and the nitrogenous principles of albumen, fibrin, etc. Some of these principles are only formed in the body from crude matters furnished by the food, while others are absorbed and utilized in their own form. Some of them are of vastly more importance to the general economy than others, but *all* should be supplied in the food, and in about the correct proportionate amounts necessary to fulfil the requirements of healthy and economical nutrition. It is a great waste of food and force, and a prejudicial tax upon a weakly digestive apparatus, to have a large amount of food supplied to it, which may either be slightly nutritious, or which may be

largely in excess of the needs of the system for those particular food principles required. The food, after introduction into the alimentary canal, undergoes by means of the digestive processes, softening, liquefaction, and to a certain degree, chemical change, before being absorbed into the general system ; and it is often the case that inability of the digestive organs to properly fulfil their office, is the inciting cause of phthisis, the body not receiving a sufficient nutritive supply. The principal articles of food used by man are, *water*, *salt*, *milk*, *bread*, *meat*, *eggs*, *oils*, *vegetables* and *fruits*.

Milk contains water, caseine and albumen, fat and mineral salts.

Bread, contains water, starch, nitrogenous matters such as gluten, dextrine or sugar, fat and mineral salts.

Meat contains water, albuminous matter, fat and mineral salts.

Eggs contain the same ingredients as meat, though in different proportions.

Vegetables contain water, starch, sugar,

gum, fat, cellulose, albuminous matter and mineral and vegetable salts.

Fruit contains water, starch, sugar, gum, cellulose, the salts of the vegetable acids, and sometimes fats.

Thus it will be seen that nearly all food contains about the same food elements, *but* the *proportionate amounts* of these principles vary greatly in the different foods. In some, water is about the only component element present; in others, starch predominates; in others, sugar; in others, fats; in others, albumen, and so on. The conditions of mechanical texture vary. Some may be eaten in the crude state, while others absolutely require the effect of heat and moisture, as applied in the process of cooking, to make them at all digestible. Thus it will be seen, that in order to supply the food elements to the system in correct proportions, qualitative selection, together with variety in the food eaten, is of the first importance. Furthermore, the digestive ability, as influenced by age, health status, and congenital anatomical conforma-

tion, is another prime factor, in deciding upon the nature of the food which should be eaten in individual cases. In furnishing a proper food supply to an individual, the following points must be taken into consideration, namely: age, health status, digestive ability and conformation of the digestive organs, idiosyncrasy, the requirements of occupation and activity of growth, and climatic influences. The offices which the different food principles fulfil in the human economy, are in brief about as follows; *Water* is a solvent, and gives mobility and inter-changeability to the different tissues. *Salt* (chloride of sodium) regulates the process of osmosis, and is an element in the composition of all the tissues. The other *mineral salts* are useful in building up the bony system; are found in the composition of the other tissues; and give the blood alkaline properties very necessary to its functions. *Albumen* and *Fibrin* are used extensively in the muscular system, and in lesser amounts in the construction of other tissues. The *Fats* are generally

found in all the tissues, are useful in lubricating and preventing cellular friction, in giving beauty to form, and in protecting the more delicate tissues: also by chemical union with large amounts of oxygen, they generate great quantities of heat and energy, throughout the body. The *Starches* and *Sugars* also produce heat and energy, though in lesser degree, by their chemical metamorphoses in the body. It having been before mentioned that age and condition have an important influence in determining what should be a proper food supply for the individual, it follows, that in the case of infants, children, the aged, and in certain persons whose digestive apparatuses are delicate, ease of absorption and suitability for the purposes of building up and sustaining the tissues, are necessary qualities that should receive consideration in selecting their food supply. Not only must the young have a sufficient amount of sugar and starch in their food, to produce the heat and energy required, but they must have a proportionately large supply of the

mineral and nitrogenous elements to build up the bony and muscular systems.

In cases of digestive malformation and inability, the digestive apparatus should not be over burdened with innutritious matters, or those hard to digest. In these cases a large proportion of the food supply should be of easily digested and assimilable matters.

The fully grown adult, engaged in active muscular exercise, needs such an amount of albuminoids as will replace the continuous waste of muscular tissue, and large quantities of heat and energy producing foods, to conserve their purposes.

In warm climates the starches are to be preferred to the fatty foods, because in their chemical metamorphoses they produce less heat. Notice must be taken of the fact that in some cases particular foods disagree with some individuals; and in extreme cases, they even act as poisons. When we inquire as to the definite proportions of each of the food principles which should be supplied in

the food of the phthisical individual, we have to deplore the fact that more extended attention has not been given to this part of the subject by those authorities who should have made it a special study. In the more socially advanced countries, the authorities supply the agricultural inhabitants with food-tables and formulas, indicating the relative amounts of the various foods which should be fed to domestic animals to gain certain results; but the subject as it relates to the human being has not received such refined attention. Until something of the same nature is done for the human race, it can hardly be expected of the average layman that he should be able to regulate his diet, as to quantity and quality, from some scientific generalities in text-books, on the nature of albuminoids, fats, and starchy matters.

In the present unavailable state of scientific knowledge on the subject, we know of no definite set of rules which could be made generally available for individual guidance in this matter. The medi-

cal adviser must apply his general knowledge and judgment to the case in hand. However, some generalities may be given as guides. For instance, we know that milk contains all the food elements found in the human body, and all that are necessary in the nutrition of a young infant. From birth until the child begins to get its teeth, no food but the milk of a healthy woman should be taken by a phthisical infant. If possible it should not be allowed to nurse a phthisical mother, and if one woman's milk does not nourish it, it should be changed to another nurse. Prepared infants' foods should be regarded with marked distrust. Perhaps in some few cases their use may be allowable, but as a general rule they are not proper food for infants. Cow's milk was intended for the coarse stomachs of calves, and human beings of an older growth. Although it is not entirely adapted for infants' food, it may be given in cases of extreme need, after properly diluting it with water, and adding enough cream and sugar to make it

more like the mother's milk. In the use of milk as an article of food, man has one of the best safeguards against Phthisis, and remedies in the cure of the disease. In fresh, rich milk is found, in readily absorbable and assimilable form, all the elements of nutrition, in very favorable proportions. It is necessary for the maintenance of the alimentary functions, that more or less bulky and indigestible matter should be eaten to serve the purpose of exciting the muscular motion of the intestines, and to give the circular muscles of the stomach and intestines something to act upon; or, in other words, to give those organs ability to carry out the function of passing along alimentary matters from one end of the canal to the other. Therefore, a continuous milk, or other fluid diet, would not be conducive to man's best health; but by making a practice of using a certain proportion of milk, with his food, the phthisical individual, possessing an alimentary tract in fairly good health, would always be sure that enough nutri-

tive matter would be absorbed, to furnish sufficient nourishment to his pulmonary and other tissues. One meets with a great many people who say that milk disagrees with them. We imagine that the reason of this is that those persons eat too much rich food in addition to drinking the milk, in consequence of which the alimentary tract has more nutritive matter furnished it than it can digest, and the surplus acts as a foreign body, exciting gastric and intestinal irritation. In other cases, the individual may have *too* good absorbing powers, and the easily absorbed milk flushes the liver too powerfully, producing functional disorders of that organ. In some few cases milk undeniably acts as a poisonous irritant to the individual. In most of these cases much can be done in the way of creating a tolerance for milk, by commencing its use in small amounts, or by mixing it with barley gruel, lime water, alcoholic stimulants, etc. In those cases where milk cannot be taken, cream, butter, and easily digested meat broths will have to

be substituted for it. In selecting a location for the consumptive, ease of access to a good milk supply should be considered of great importance. Canned condensed milk makes a good substitute, and may be taken on hunting or other expeditions in wild parts of the country. Drinking the milk of goats, asses, prepared kumyss, etc., has, as a general thing, only the advantage of an appeal to the invalid's imagination, giving him the comfort of expecting relief from their use. Kumyss however, is often of great value in cases of delicate stomachs. Let us then, lay down, as a rule, that the phthisical individual should drink a certain moderate amount of milk at each meal, avoiding the excessive quantities which are frequently recommended. In regard to other foods, we will only formulate dietetic generalities. As a general thing, the habit of eating fatty foods should be cultivated on account of their very high nutritive values; and furthermore, because in consumptive individuals, the ability to digest them is usually limited—this

lack of ability being either natural or acquired.

The great majority of persons who have the disease, or a tendency to it, accumulate very little fatty tissue and object to fatty foods. This may be caused by some deficiency in the construction, or functional abilities of the pancreatic gland, whose secretion has emulsive power over the fats, enabling them to pass into the system in the form of an emulsion. The most effective fatty food for phthisical individuals is cod-liver oil, it being more easily digested than other fats, and ranking highest for its power of producing heat and energy. It should be taken at, or just after, meals, in quantities as great as can be digested —a point which can be ascertained by examining the feces for signs of undigested oil. It may be given gradually, in order to accustom the patient to it, a teaspoonful three times a day after meals, being enough to start with. It should not be given in those cases where there is much fever present. It may be

taken in the froth of porter, or the mouth may be rinsed out with a strong alcoholic beverage before taking it, or it may be advantageously used in the form of an alkaline emulsion flavored with bitter almond, wintergreen, etc. If the disgust for it is unconquerable, butter, cream, olive oil, glycerine or other easily assimilable oils, will make a tolerable substitute for it. Beef fat, which stands next to cod-liver oil in nutritive value, is unfortunately difficult of digestion, and is therefore not of much utility to the invalid. So far as other foods are concerned they may be eaten in variety and in proportions to suit individual cases, though the starches and sugars are hard of digestion, and should be used sparingly. It must be borne in mind that a great help to digestive activity, is the reflex action on the digestive organs, following titillation of the terminal gustatory nerves, by savory food. If food is not pleasing to the taste, it does not digest as well as it otherwise would ; and the proper culinary preparation of the

consumptive's food should be considered as a highly important item in the treatment of this disease. Great attention should be given to furnishing a pleasing variety, and to exciting the appetite by savory preparation of the food. It must be understood, that the idea to be carried out, is to induce the patient to eat all the properly selected food that he can digest, and to waste no force by eating food that contains disproportionate amounts of the various principles needed in the active nourishment of the various tissues of the body. To furnish some criterion of the amounts of the various kinds of food which the phthisical individual needs, we may mention that an active man in full health requires about the following amounts of the various food principles during one day, namely: water, 2000 grams; mineral salts, 20 grams; fat, 100 grams; starch and sugar, 300 grams; albuminous matter, 130 grams. These are represented in the following amounts of food: water, 1530 grams; butter or fat, 100 grams;

bread, 540 grams; meat, 433 grams. A gram is the 32d part of an ounce. Besides this food supply, a man needs a certain variety of fresh vegetables, fruit, sugar, milk, etc., to maintain him at the best health status.

When the phthisical process is active, it must be remembered that nutritive matter has to be introduced into the individual, not only in sufficient supply to meet a normal demand, but also to meet the drain caused by the expectoration, and by the over-active tissue metamorphosis which is coincident with the fever. Of course in treating the disease, the activity of the intestinal canal must be regulated by giving proper attention to the coarseness and irritating qualities of the food used. In phthisis, the skin may be utilized in aiding the alimentary tract to absorb nourishing matters, as for example, by the inunction of fats. Cod-liver oil is the best fat for this purpose, but it stains the skin and its odor is offensive. Perfumed suet is a more elegant material, and may be used if

desired. After a warm bath at night, a couple of ounces may be rubbed into the skin, and a thick night-gown worn to prevent soiling the bed-linen. Blood from the butcher's shambles may be thus introduced through the skin. The custom of drinking fresh blood is often recommended, and if the patient can stand such a disgusting draught, it is a beneficial practice, but good milk ordinarily answers the purpose just as well. Shall alcohol be used in phthisis as a *food?* Some years ago, alcohol was exalted as a remedy of great virtue in phthisis, but in this day the tendency is toward great moderation in its use. However, great and radical differences of opinion exist on this point. The use of alcohol as a beverage by the normally healthy individual, can only be more or less harmful, though a certain amount introduced into the system will fulfil the purposes of food in the production of force and energy. This amount is from one to two ounces taken in the course of twenty-four hours; and it seems that

in persons with poor digestive and deficient assimilative abilities, the use of a moderate amount of alcoholic beverage may be beneficial, producing some force, stimulating the circulatory system to greater activity, and improving the digestive processes by gentle irritation of the gastric mucous membrane. If it is taken, it should *always* be *moderate* in *quantity* and *much diluted* as to *quality*. The malted liquors and sweet wines should always be selected in preference to the stronger beverages; the former, because they contain a slight amount of nutritive matter in addition to the alcohol, and the latter, because of the absence of acidity, and the presence of those flavoring and odoriferous oils and ethers which have a stimulative effect on the digestive function. There should *not* be enough taken to quicken the pulse, to flush the face, or to affect the head. When such symptoms are observed, the alcohol is doing harm as a food. The alcoholics may be given ad-

vantageously and pleasantly, beaten up with egg and milk.

An important point in the prevention of phthisis, is that the food of the young should be of a simple character, though nutritious. They should be made to avoid tea, coffee and other nerve stimulants, pastries, confections and condiments that will give them a distaste for simple food. While it should be seen that a full nutritive supply is taken, the stomach should be trained to digest simple and rather bulky foods.

Physical Culture in its Relation to Phthisis.

"In the sweat of thy face shalt thou eat bread till thou return unto the ground." Thus wrote the law-giver, and whatever one's opinion may be as to the divine origin of the above sentence, it must be conceded that it contains the essence of a physiological law of great importance. If a man does not work, and incidentally sweat for the means of his subsistence, he must do so if he wishes the best of health. It is a physiological fact of prime

interest to this subject, that the various organs of the body must all carry on their functional actions, between sufficient periods of rest, with continuity, regularity and vigor, to maintain an elevated general physical status, and this is particularly true of the largest system in the body—the muscular system. Motion of all parts of the body is essential to health. Even the brain has need of the motion it receives from the throbbing of the arteries. Along with purity of air and the proper nourishment of the tissues by selected food, the relation of exercise to phthisis is of the greatest importance in considering its treatment. If the various parts of the body are not exercised, degeneration and loss of function in those parts follow. This is readily noticed in the nerve degenerations which follow disuse of the conductor nerves, examples of which are seen in paralysis. The degenerative change can also be noticed in the eye, in cases of disuse of that organ.

Exercise conduces to the nutrition of the body in various ways. *First*, the

functional motion of an organ, by compressing the venous blood from the tissues, accelerates the circulation, and rapidly makes room for the reception of fresh blood, with consequent increased nourishment of the anatomical elements composing those tissues. *Secondly*, the lymphatic flow is also accelerated in the same way. *Thirdly*, exercise stimulates an increased action of the heart and chest, and so, by a quickened circulation and increased arterial pressure, the general nutritive processes are improved. Hygienically considered, the *prime* motive for taking exercise should be to strengthen the action of the heart and lungs, and to bring about a healthy development of those organs. *Fourthly*, exercise acts beneficially by giving motion to the various abdominal organs. This generates friction and pressure in those parts, causing blood to be directed to them, the result of which is their increased nutrition and functional activity. *Fifthly*, exercise acts beneficially in diseased conditions, especially in phthisis, through the derivative effect

which exercise of other organs of the body has, in drawing away from the lungs or other diseased parts, the excessive blood supply usually attendant upon the disease process. *Sixthly*, exercise acts beneficially when it brings the individual into contact with a continually changing and hence purer atmosphere, and presents to his notice new sights, sounds, and smells, all of which have a stimulating influence on the general system through the medium of the special organs of reception, that is, the eye, ear and nose. *Seventhly*, exercise acts beneficially by increasing the activity of the excretory processes, thus ridding the system of not only useless, but it may be, of injurious excrementitious products. *Eighthly*, exercise is beneficial because it gives opportunity for the development of parts of the body which may be congenitally deficient. *Ninthly*, active exercise improves the general system, by giving the individual a good appetite, and by causing rapid tissue changes. *Tenthly*, exercise accustoms the anatomical elements of the various tissues of the body to the

performance of their functions with quickness and ease. The dexterity that comes with practice, so readily observable in the complete complex organism, is the result of repeated action in the minute cell. It is not alone sufficient that nutritive matter be closely and continuously presented to the cell element for its nutrition, but the cell must also receive the nervous influence which calls it into functional activity, before it can attain that healthy tone which is necessary to the make-up of the firm, dense, tough and resisting tissue that will be able to withstand hard usage.

The exercise of the tissues of the body should be a harmonious and regular development and use of each and all of the various organs of the body up to the full exercise of their functional activity. In theory, an individual can only be said to be in perfect health when *all* of the various tissues of the body are thus called into use, whether that use be a function of motion, of resistance, of support, of secretion, of excretion, or of origination

or transportation of the nervous influence. Practically considered, such refinement of cultivation cannot be carried out in any single case, and much less so would it be possible in the lives of the vast majority of human beings. In most cases, the exercise of the muscular system as the largest, of the nervous system as the motor incitor, and of the digestive organs because of their prominently important functions, must suffice. These systems being kept in good order, their influence will usually be sufficient to maintain the rest of the body in the right channels of healthy nutrition. It is not only necessary that the muscles be used, but the vigorous culture of willed effort is so important that it must not be neglected in any case of phthisis.

It must be borne in mind that abuse of any part by *excessive* exercise, is not a virtue. The over-developed muscle is in an abnormal state, and invites disease. The over-used nervous system results in general prostration.

Professional athletes usually live short

lives, being liable to die of disease of local parts, as of the heart or lungs, or from over-nervous strain. In some cases of phthisis, the application of correct principles of physical culture, would at once call for less active use of the whole, or of a part of the body. There are many restless, nervous individuals whose digestive organs do not supply sufficient nutritive matter to nourish their bodies, or else, whose periods of rest are too short to allow of reconstruction of the over-used tissues. Rest is the sole remedy, which, if taken in time, would save many an individual from an attack of phthisis.

While thorough exercise of the pulmonary organs is a requisite in the prevention of phthisis, just as soon as the disease process commences, a change of treatment is required. Then, as much local rest as possible must be given to the parts implicated ; and to effect this, violent functional use of the lungs must not be called for during the active stage of the disease. Systematic gentle

exercise may be taken by filling the lungs moderately, and then holding the breath, allowing the inspired air to expand, and thus dilate the air cells. This is all the special exercise that can be given with benefit to the lungs. *Violent* muscular exertion, excessive emotion, great respiratory effort, such as is needed in shouting, etc., or doing anything that will bring about excessive respiratory action, should be avoided. Rather, on the other hand, should use be made of the *derivative* benefits of exercise by using the neighboring and distant organs of the body, and thus calling blood away from the excited diseased parts. In cases of congenital malformation much can be done by physical culture to remedy the defects of conformation. Badly formed chests, such as the flat, contracted and pigeon chests, may be much improved in form and functional capacity by the proper exercise of the upper part of the body, and by cultivating the habit of holding the trunk and limbs in good form, training the various muscles to

hold the chest in correct position. The fact that persons who have the most symmetrical chests are usually left-handed, is a good illustration of the development that exercise will give to the chest. It is only carrying out the well recognized physiological fact, that the use of an organ increases its size and functional capacity. A deficient digestive apparatus may be vastly improved by some jarring exercise, such as is gained in horse-back riding, and by systematically eating such bulky foods as will give it considerable work to digest and to move along the digestive tract. In the prevention of phthisis, it is very important that such exercise as will develop the chest and its contained organs should be attended to with regularity. Children should be required to maintain habitually an erect position in standing and sitting, which habit will tend to give the chest a good external shape and internal capacity. If the child is allowed to stoop and lounge, the muscles which hold the chest in shape lose their tone and waste away

through disuse; the bodies of the vertebral column, through unequal pressure, become uneven, and after that malformation occurs, the regaining of a correct position is difficult, and complete chest expansion is interfered with. The interference with the motions of the chest by constricting dress, is a great and potent evil. The use of proper furniture, such as square-backed chairs, of a correct height to allow of the resting of the feet on the floor, is an item of importance to be considered in the cultivation of a good form in the young.

A correct position in sleep should be demanded, with a view of preventing deformity. Of all the forms of exercise beneficial to the phthisical individual, *walking* stands pre-eminent. In walking over a diversified surface, the motion exercises nearly all the organs of the body.

The muscles of the upper part are actively engaged, being called into use in the process of balancing the body. Walking has the advantage of being so

easily regulated as to the amount of force expended, that respiratory effort need not be carried on too energetically. It is conducive to an erect posture of the body; it brings the individual into contact with fresh air, and with change of scene; and it acts derivatively, by attracting to the great muscles used in walking, the excessive supply of blood that is drawn to the lungs during the phthisical action.

Running is beneficial in the prevention of the disease, by encouraging vigorous respiratory action, thus enlarging and giving increased nutrition to the pulmonary tissues. It is *not* to be recommended in cases of mal-nutrition, or great delicacy of the pulmonary tissues; and it should not be practised when it produces pain in the pulmonary region.

Horseback-riding is the lazy man's exercise. It is particularly beneficial in giving the internal organs, especially those of the abdomen, stimulative exercise through the jar and shaking received. Its practice is highly beneficial in cases

where the digestive apparatus is sluggish. The stimulus which comes with the novelty of position and motion also has a good effect. It may be taken advantageously as an occasional change in the regular routine of exercise. It does not give a harmonious development to all the muscles of the body, and unless great care be taken, encourages a stooping habit, induces round shoulders, and gives a waddling gait to the walk of males. It may be taken where walking for some cause is impossible.

While walking is the best exercise to develop and retain in health, the lower extremities, the upper portion of the body needs some accessory exercise to fully develop it, and to call out its functions. The best special exercise known to us for this purpose, is the use of Indian clubs. In performing the various exercises with these implements, the whole upper part of the body can be fully and harmoniously exercised and developed to any degree without strain, and at any rate of speed that may be practicable.

As accessory to this method of physical culture, and beneficial, if practised occasionally, may be mentioned *sparring* with the sand-bag, and *fencing*. *Skating*, if practised in moderation, is a fine exercise for both males and females, but care should be taken not to carry it to excess, and to prevent sudden cooling and chill. *Bicycling* is a fashionable amusement of the day, and if moderately indulged in, is a tolerably good means of exercise, though a great many serious accidents result from it, through the falls received. *Rowing* is a good occasional exercise. If excessively practised, it tends to pull the shoulders forward and the ribs together. *Wood-chopping* and *sawing* are useful, but little known, accomplishments, in this day of steam machinery. *Whipping the trout streams* is a splendid exercise for the phthisical individual, and in many cases *hunting* is also beneficial. The greater part of ordinary *farm work*, especially pitching hay *outside* of the dusty hay-loft, is decidedly beneficial, if not overdone. Exercise that requires excessive

strain should not be encouraged, although a certain amount of strain results in functional benefit to the muscles, ligaments, bones, etc. *Dumb-bells* are a monotonous source of exercise, and are liable to produce strains. For those who are too stout; for those who suffer from inactivity of the abdominal organs; for those who may be crippled; etc., the *jolting chair*, a mechanism actuated by handles, moved by the individual himself, is a good and convenient substitute, for horseback-riding, and even possesses some advantages peculiarly its own. The *joggling board*, a long, elastic board, with its ends resting upon supports, offers a means for very moderate exercise, for very stout or very delicate persons. It is very much to be deplored that so few occupations are calculated to give a harmonious development and exercise to all parts of the body.

The very delicate phthisical invalid cannot of course take very active exercise, and for him driving, perambulation or sailing will have to be substituted;

the latter, though the mildest of all, is very beneficial. Something can be done for the great invalid or for the incorrigibly lazy individual, by the passive exercise known as *massage*, in which the whole body is beaten, punched, rubbed and pommelled by another person, either with the hand, or with machinery used for that purpose. We regard a regular daily rubbing of the whole surface of the chest with towel, flesh-brush or hand, as one of the important items in the successful treatment of phthisis. It should be done, preferably by the patient, at least twice each day, and with sufficient vigor to keep the chest muscles and other tissues in a high state of health. The practice toughens the skin, and prevents it from easily receiving impressions from cold, and it also acts derivatively, drawing away blood and nervous influence from the lungs. The intercostal muscles should be kept well developed by a regular habit of taking deep but gentle inspirations. As before pointed out, it is very important to surround the

pathological process with tissues that will not only resist, but which will also influence in a beneficial manner, the diseased tissues by their own healthfulness. Congenial and hygienic work, is one of the best remedies in the prevention of phthisis; and regulated exercise, and occupation for the mind, is a *sine qua non* in its curative treatment. It is important that the phthisical individual should manage, if possible, to get his exercise in the course of his daily occupation or amusement. Exercise taken by itself only for its effects is rather dull work, and is very liable to be neglected; nevertheless, it should not be neglected, and should be a *religious* daily duty, as much so as making the toilet, or eating a meal. The temperature in which exercise is taken is a point that should be considered. Active exercise should, if possible, be taken in a temperature lower than that in which the patient sits while at rest. This is easy to accomplish in cold weather, but it is a difficult matter to arrange in warm weather. At such times,

the patient should be careful not to incur too great and sudden changes of bodily heat, and he can do this by careful regulation of his clothing, and by not over-exerting. He should dress lightly while exercising, and then should put on additional covering when resting. Even in winter, when over-clothing is worn out of doors, it is always prudent to retain the additional clothing for a few minutes after returning indoors, so as to prevent the body from being too suddenly cooled. A vast number of colds are due to this sudden indoor cooling after active exercise. The winter visitor to the Bermuda Islands, where the interior atmosphere of the houses is usually cooler than the outdoor atmosphere, is quite astonished to have to put on his overcoat when he goes indoors, and to discard it when he goes out.

To get the utmost benefit from exercise, it must be taken vigorously, and to a sufficient degree to fully test the functions of the various organs exercised. The thin-blooded student, who takes a

slight stroll as his daily exercise, can hardly comprehend the delicious glow of vigorous health which he would feel through his whole organism after several months of active work on a well regulated farm.

Heredity in its Relations to Phthisis.

The marriage relation is an outgrowth of the influence of the second great instinct of human nature, namely, that of reproduction.

As people rise in the social and intellectual scale, various other influences of an ethical and practical nature regulate the coming together of the sexes in this relation. How often, even in this day of supposed enlightenment, do any of the contracting parties ever consider the result of the contract from the physiological point of view? It must be conceded that scarcely a recognizable percentage of the whole of mankind do so. The pecuniary side of the question is always looked at from every point of view, and even the social standing of the two con-

tractors is criticised and comparatively balanced in the scale of social equalities; but the effect the marriage may have on the health of the man and the woman, and the quality of the progeny they will be able to give to the world, is scarcely ever thought of for a moment. It is true that the law forbids the marriage of very near relatives, and parents are liable to look askance at present ill-health, as being likely to interfere with the material success of the young couple. But how often do parents call in a medical expert to sanction the legality and morality of the marriage, judged from the physiological point of view? And how often is a physical examination made before marriage by an expert with a view of ascertaining their physical adaptability to enter into the estate, and to carry out the high duties of procreation? It may be said, *Never*. It should be done, *Always*.

As the result of this reprehensible neglect on the parts of individuals and governments, we find a system of breed-

ing among human beings, which would, if imitated in the breeding of domestic farm animals, be considered a disgrace to the agricultural economy of any civilized people on the face of the globe. Contemporaneous man is an artificial animal, and is naturally inclined to return to the original type; hence it is a necessity, if the best artificial status be retained, and improvement in the race expected, that he should exercise great care in breeding, as well as in living. It is to be regretted that among the great majority of the race, individual preference and desire, coupled with opportunity, are about the only influences which take part in the production of a, too generally, malformed and degenerate progeny. Under this state of affairs, we see the man permeated with syphilis, unrestrictedly marrying the pure young girl, thus entailing misery upon her, and her descendants. The scrofulous, the insane, criminals, paupers, and many others whose children are entirely unfitted to do anything for society but harm, all marry and

reproduce; and yet society makes no great protest against the evil. Perhaps this evil of unregulated human breeding is as fully seen in the production of consumptives, as in any other undesirable class produced. There is either the mating of two individuals whose ancestry have a distinct phthisical history, and whose progeny will almost certainly fall before the disease; or else the anatomical formation of the parties is so peculiarly faulty, that their children will probably exhibit great deficiencies in some part of their pulmonary or alimentary structures; or, if the parents are debilitated by debauchery, intemperance, or syphilitic and other diseases, then the children also become fit candidates, to swell the death-rate from phthisis.

There are, we suppose, very few thoughtful persons who would not admit that this state of affairs is all wrong. *In the proper regulation of reproduction, is found the most radical and effectual measure that can be adopted in the prevention of phthisis.* We contend that viewed

by the highest standard of morality and enlightenment, no individual decidedly tainted with the phthisical tendency, should do the world the wrong of bringing forth a progeny, cursed with inefficiency and inability to carry out the functions of an ordinary life. Some may say that this is too high an ideal; but it is an ideal that is adopted and practised by at least a few individuals who have right ways of thinking. The writer had a friend, a young lawyer, brilliant and courted, who could have chosen a wife wherever he would; but he was cursed with an hereditary taint of phthisis, and determined that he would never be guilty of extending the curse, and so went on in life alone. When the age at which phthisis usually showed itself in his family came, consumption developed in him, and he died, happy, at least, in having performed a heroic task in life, even if it were a negative one. All honor to such a brave being. It is hardly to be expected that such sacrifice of desire can be looked for, in this day at least; but certainly, phthisical individ-

uals can make a selection of a partner in marriage, who shall have the physical qualities necessary to annul, in some measure, the bad traits which otherwise must appear, more or less, in the first, or a later generation of their descendants, for it frequently occurs that the disease tendency skips one generation, and appears in the second or third.

It is particularly desirable that the wife be robust and healthy, as she has during the first months of existence, the sole ability to furnish the nourishment necessary for the healthy development of the growing child. The mother should make, during gestation, a special effort to keep her health up to a high status, by eating proper food, and by freely taking gentle exercise in the open air. The condition of the health, both of the father and the mother, at the procreative period, has a most important effect on the health of the future offspring. There are numerous instances on record, where a phthisical father produced phthisical children while his disease was

in progress; but with his recovery and the regaining of vigorous health and strength, the children then born to him were healthy.

Weakly and delicate children are likely to be the reproductive result of debilitated parents, and of course all such are exposed to, and are particularly liable to be affected by, the special irritating and mal-nutritive causes producing phthisis; and so, in this way, does hereditary influence help in the production of phthisis, and increase the improbability that it is likely soon to become a rare disease.

Occupation in its Relations to Phthisis.

The old Mosaic record declares that work is a punishment visited upon mankind, because of the pomological curiosity and gustatory tastes of our ancestors, Adam and Eve; but modern physiology shows that the regular functional exercise of all the various organs of the body, is essential to the health, not only of man, but of the lower animals, as well. With-

out deciding upon the merits of these two explanations of the universal industry exhibited by animals, it is enough for our purpose to recognize the universality and the necessity of work. Occupation of one form or another, whether engaged in for mere amusement, or for the imperative necessity for gaining a subsistence, is an absolute essential to man's perpetuity. The occupation in which he is engaged largely determines his happiness and prosperity, or brings to him poverty, misery and disease. The conditions that surround the vast majority of men, determine what their occupation shall be, and the individual seldom has much of a choice in the matter. Unfortunately for many, their occupation is such that it is not compatible with good health. The deprivation of light, the forced requirements for breathing foul air and mechanical irritants, and the slight remuneration received preventing the procuring of proper food, are all concomitants of many occupations, and are prominent factors at work in the production of phthisis, and

in the prevention of its cure. Among the occupations having a peculiarly deleterious effect, are those which produce much dust, such as steel-grinding and polishing, stone-cutting and polishing, milling, mining, tobacco-working, etc. A prominent axe company says, that it cannot get its grinders to live over four years; they acquire phthisis. Another class of occupations unfavorable to the phthisical, is such as give rise to irritating and depressing vapors; as, for example, japanning, fertilizer manufacturing, etc. Another class, is where the work is sedentary, and the individual works in badly-ventilated rooms. Tailors and shoemakers are very liable to have phthisis. The reason why shoemakers should so universally work in poorly ventilated and overheated rooms, is one of the unexplained facts observed in the experience of a lifetime. Furthermore, the evils of damp air, of wet clothing, of over-work, etc., are incident to many occupations causative of phthisis.

In every case of phthisis the nature

of the patient's occupation should receive close attention. In many instances, a change of occupation, or a correction of the evils coincident to it, will be all that is necessary to bring about a curative influence. The question of occupation for wealthy patients is not a very perplexing one to the physician. The resources of travel, of the hunt, of athletic sports and amusements, of sailing, of pleasure farming and gardening, etc., are available; but what shall become of poor individuals, especially women, who must die unless change of occupation be afforded? There are at least some occupations open to these poorer people, in the pursuit of which, health may be gained, and some pecuniary return as well. For men, agricultural industry in all its branches, is open. There are hundreds of thousands of farmers located throughout the healthful parts of the country, who would be glad of additional help during the busy season, even if it were accepted with restrictions as to over-work, avoidance of the dust of the hay loft, and requirements

of a plentiful supply of fresh milk and eggs to the phthisical worker. Turpentine farming in the elevated pine forests of the South, is a particularly advantageous winter pursuit for the individual with a phthisical tendency, either if he engages in it as director of the business, or if he merely hires himself as a laborer, and swings the long-handled axe in boxing the trees, or later in the season collects the crude turpentine from them. For those who have sufficient vigor, the life of the lumberman, either in the Southern or in the Northern forests, during the winter, is advantageous; and in some localities, lumber sawing is a healthful pursuit Vegetable, fruit and flower gardening, is a field open to many, except in the neighborhood of the larger cities, where there is too much competition from a very hardy and hard-working class of people, who are able to withstand great exposures to severe climatic influences. Gardening in the milder climate of the South, is a continually growing industry. Orange and other fruit culture, in Florida and in

Southern California, is a fascinating and desirable pursuit, for those who have the means and patience to wait for returns. The cattle and sheep business on the plains offer attractions for many, and certainly abound in opportunities for healthful out-of-door exercise. Stage, car and truck driving, is generally conducive to a state of health that would prevent an attack of phthisis.

When we consider the healthful occupations open to women, there is less diversity of choice. Domestic service in the houses of the closely-built city, is not a healthy pursuit, but the demand for willing domestic service in all the suburban villages, and on all the farms of the whole country, is unlimited. Cooking, and sweeping, unless a respirator is worn, should be avoided as much as possible; but almost all the other work of a well-lighted, ventilated and heated suburban residence, is particularly well adapted to the phthisical woman. Of course no confirmed phthisical person should have the care of children. As an independent

industry, well adapted to woman's physical abilities, and which offers a fair chance for a moderate success, may be mentioned the raising of poultry, both for their eggs and flesh. The demand for good poultry and eggs is unlimited, and the only reason why their production should not be made a special industry, is the item of labor; the main requisite to success being the careful attention which should be given to the minutiæ of cleanliness, protection, etc. One of the most successful bee raisers in America is a woman, and there is no reason why the keeping of bees should not be largely extended as a lucrative pursuit for women, as well as silk culture, which is now beginning to receive considerable attention. The points that should be considered in the selection of an occupation suitable to the phthisical individual, are taste for the pursuit, opportunity to breathe pure, unirritating, non-depressing air, chances for taking a great amount of exercise in the outer air, and requirements which do not necessitate exhaustive efforts. It should be borne in

mind that in some cases over-worked individuals will find rest, by change of occupation.

As most of the evils which accompany the various industrial pursuits may be corrected, or at least reduced very largely, why should not employees have the advantage which such corrections will give? This is a question of right, that employers of labor should consider, and which governments should legislate on, for the good of the people.

Dress in its Relations to Phthisis.

It would be impossible to express the exact ratio of causative influence that improper and insufficient dress has, in the production and perpetuation of phthisis; but if the indirect influence that impropriety of dress has on the general health, and the diseased results which are due to inadequate use of the protective properties of dress, be taken into account, then the ratio is a considerable proportion of all cases of phthisis. The principal and most important use of dress, is to regulate

the rate of loss of heat from the surface of the body. Its lesser use, is to protect parts of the body from mechanical injury, from moisture and from excessive heat.

Owing to the love of adornment, and the caprices of fashion, these uses are very frequently perverted. If the *uses* of dress are fulfilled, there is no legitimate reason why dress should not be made a matter of artistic study, of pleasing variety and of personal adornment. These æsthetic uses of dress, however, should not be primarily considered, nor allowed to interfere with the health of the individual.

That such misuse is practised so frequently, requiring unhygienic exposures of the bodily surface, or excessive covering for it, or causing mal-forming pressure intended to alter the shape that nature has decided to be best adapted to the carrying out of the active functions of human life, is only very strong evidence of the lack of intellectual development, distinguishing the men and women of the present day.

The temperature of the atmosphere in which the majority of the human race lives, being usually below that of the body, clothing is either conservative in preventing a wasteful loss of heat from it, or else it is an absolute necessity in preventing more heat from being radiated and conveyed from the surface of the body, than can be manufactured and maintained by the chemical and mechanical processes at work in the various tissues. Dress accomplishes this purpose, by the interposition of a good non-conducting material between the surface of the body and the atmosphere, thus retarding the radiation of heat from the body. It also prevents heat from being conveyed away from the body, by means of fresh, cool, air being brought too quickly in contact with its surface. It must be understood that this process of intervention is only a comparative one. There is hygienic necessity for some direct contact of the air with the body, and such air should be continuously renewed, though with comparative slow-

ness. Hence, articles of dress should always be more or less porous in their nature, and for convenience, it is also necessary that dress should be light in weight, flexible, soft, and not too bulky in texture. The material, the qualities of which most universally fulfil these conditions, is wool. In itself it is a very good non-conductor of heat, and when made up into fabrics, it entangles among its meshes, by reason of a peculiar mechanical or chemical attraction that it seems to possess for gases and vapors, a large amount of air, which is also a good non-conductor of heat. Wool possesses good wearing qualities, and about the only objection to it is that it is irritating to some delicate skins. As a means of preventing shock, resulting from sudden changes of temperature, and for the purpose of absorbing perspiration, the phthisical individual should wear at all seasons of the year woollen under-garments, which should be made to entirely enclose the chest. Such a garment should be worn high in the neck

at all seasons, and should have long sleeves during cold weather. In warm weather short sleeves may be worn with a considerable amount of comfort to the patient. Part woollen fabrics may be worn in cases where the skin is irritable Cotton, next to wool, is the best material for general use in the manufacture of dress. It is not so good a non-conductor as wool, does not make up into such light and air entangling fabrics, and does not wear so well. However, it is of great use in the manufacture of garments for warm weather. Silk and linen, being better conductors of heat, than cotton, though wearing well, are not of much practical use to the phthisical patient in fulfilling the office of protection. Silk is less objectionable than the latter, but linen under-garments and bed-clothing should be carefully avoided by the consumptive, as they convey away the bodily heat too rapidly, and by conducing to chill and shock, cause too great a continuous draught upon the vital forces. The character of dress used by the phthis-

ical individual requires careful consideration. It should protect the *whole* surface of the body sufficiently, and must not over-heat any particular part. If any favoritism is shown in protecting any parts of the body of the phthisical person, it should be the chest, because of the susceptibility of the pulmonary tissues through reflex action, to temperature changes affecting the *exterior* of the chest; and the feet, because when they become cold through being inadequately clothed, or getting wet, rapid loss of heat follows, circulation in them becomes retarded, and determination of blood to the pulmonary structures is then induced. The average dress of the male of the day, has attained a considerable height of hygienic practical and æsthetic excellence. One of its defects is in leaving an exposed place over the front of the upper part of the chest for the purpose of displaying a shirt-front that may be more or less immaculately white; but this defect can readily be rectified, and usually is remedied, among men of intelligence, by the

wearing of a chest protector underneath, or a thick scarf over the shirt-front.

More frequently the man makes a mistake in wearing fashionably-shaped shoes of too small a size, making his feet fit the shoes, thus deforming the feet, giving himself much discomfort, and throwing a prominent obstacle in the way of his taking sufficient walking exercise. The foolishness of the last generation in wearing excessively thin foot covering, is not seen so much in this day. With his thick arctic shoe for winter, and a thin rubber overshoe for wet summer weather, the man of to-day is usually comfortably and hygienically shod. There is still an advanced step for him to take in this matter, and that is, in having the shoe made to fit the foot. There should be plenty of room in the shoe for the foot to swell, as it does when a sufficiency of pedestrian exercise is taken. A little experience will show the amount of room necessary for comfort. The foot should be measured after a brisk walk, while the blood is attracted to it, and the sole of the shoe

should be of a shape and size of the surface of the foot which touches the ground, with additional room in front of the toes, to prevent the stubbing of those members.

The man of phthisical tendencies should carefully avoid one popular custom in dress, and that is of discarding his usual clothing for the evening, so-called, full-dress suit. There are few easier ways of bringing on an attack of pleurisy, bronchitis or pneumonia, than to don a thin evening suit, and to go out on a cold damp night, for an evening's amusement.

If it must be worn, the individual should always wear a compensatory addition of extra under-clothing. There are few more significant evidences of the advance in general intelligence, during the past few years, than are shown by the sensible changes instituted in the dress of children, during that period. The bare-necked, bare-armed, bare-legged, thin-slippered children of twenty years ago, are now very rarely to be seen. In fact, the clothing of young children in the present day, leaves very little to be

desired, either in a hygienic or æsthetic point of view. The principal deficiencies are, in not adding extra clothing for out-of-door use, to the rather thinly clad lower extremities, during cold weather; in not having them wear sufficiently heavy under-clothing over the whole neck and extremities; and in wrapping the neck in furs, a practice which is liable to cause delicacy of tissue in the neighboring parts, by over-heating.

When we leave the dress of man and child, and come to that of woman, what is there to say? It seems all wrong, from the top of the much-puffed and tortured head, to the toe of the thin, no-top and almost paper-soled slipper. Why in the name of all that is mysterious, does a mother, who has exercised a very considerable amount of common sense and enlightenment in clothing her young children, seize upon her daughters as they approach the age of puberty, habituate them to customs of dress which are in every way calculated to repress healthy life, and to plunge the poor girls into

ill health before they are fully grown? Among our higher classes, who have the best opportunities to live healthy lives, it is a very rare thing to meet a fairly healthy woman of twenty-five years of age; and a still rarer sight to see a married woman of thirty years, who has borne children, in possession of fine health.

Our American young women are not a class of whom, physically speaking, our nation may be proud. We do not hesitate to state our belief, that the follies and misuses of dress, customary among our women, have more to do with the production of this state of affairs, than any other single cause. Their clothing not only deforms them, but it inadequately clothes them on some parts of the body, and over-clothes them on other parts; and above all, it is an obstacle to almost all active exercise so necessary to their health. Why should a woman pin on the top of her head a mass of defunct hair, arranged with an expense of ingenuity and time that would suffice to give her a thorough training in the laws of hy-

giene? Why should she perch upon it some airily-constructed arrangement of straw, feathers and flowers, that does not in the least subserve the purposes of protection, but which results in entirely unfitting the wearer for meeting the ordinary atmospheric emergencies of breeze and shower? Why does a mother strap her daughter's waist in a "corded" girdle while still a young child, and into a corset at fourteen years of age, and keep strapping it until the abdominal and dorsal muscles and fasciæ are all atrophied, or wasted, and have lost their functional ability of support; until the intestines are forced down into the pelvis, or over the brim of that bony basin, which procedure gives the young woman a pendulous abdomen, or, maybe, dislocation of the uterus, with consequent misery for life; until the lower ribs are crushed downward and inward, and the liver and stomach are pushed upward and atrophied, and that great blood-vessel, the abdominal aorta, cannot pass half its blood supply, and the returning veins are obstructedly

congested, and the absence of abdominal breathing would indicate that the diaphragm was not the chief muscle of respiration; while upper thoracic breathing has to do the whole work of aërification of the blood? Why do women wear such long and such tight skirts that they could not take a brisk walk, even if their pulmonary organs could aërify their blood fast enough to carry on the needed muscular exertion? Why do women wear foot apparel so constructed that it keeps them standing upon their toes; that is so small for them that their toes are all compressed into an undistinguishable heap, and that is neither thick enough to resist the ordinary moisture of the public road, nor to keep the feet warm enough to maintain a proper circulation in them? Why do they wear open-work silk stockings with slippers entirely open on the upper surfaces of the foot, thus practically giving their feet no clothing at all, and following an almost sure method of inducing a determination of blood to the pulmonary structures? Why do phthisi-

cal women, when they are told to wear woollen under-clothing, get short-sleeved undershirts cut low in the neck; and why, when they want to be *fully* dressed, do they bare so large a part of their bodies to the public gaze? These, and many other pertinent questions that might be asked, may have reasonable answers, but they are beyond the ken of the writer. We merely wish to record here as our decided opinion, that these *peculiarities* in women's dress, largely influence, directly or indirectly, the production of phthisis, and that, in the successful treatment of the disease, they are evils that *must* be corrected. We do not hesitate to say that the putting of a corset on a young girl of phthisical tendency is an action that almost certainly dooms her to death from phthisis. A very remarkable thing in connection with the subject, is that there is scarcely a woman who ever believes that she is guilty of tight lacing, or who can understand that even slight pressure upon the waist, can bring about malformation in that part

of the body, or seriously interfere with its functions. There can be no better visible evidence upon this point, than to observe the wasting and change of conformation which takes place, even in an adult, as the result of an application of a plaster jacket. It is true that woman naturally breathes more with the top of the chest than man, but it is not nature's plan that breathing with the lower part of the chest should be abrogated in *any degree*, as it *always* is in the case of any one who wears a corset or a tight waist.

Of course the tighter the constriction around the waist, the greater will be the interference with the functions of breathing, etc. No one should be willing to allow such an interference with the healthful functions of the body, and much less so, any one with a phthisical tendency.

Very often the pointing out of some apparently *unimportant* impropriety of dress, as for instance, wearing insufficient clothing around the upper part of the chest, or wearing no-top slippers instead of warm shoes, will be the deciding influ-

ence that will direct the phthisical invalid out of the road of no hope, into the road leading to cure. As in cases of pulmonary trouble, an additional amount of clothing is needed around the weak and sensitive chest, it is better to have some special article of clothing made that will be adapted to the top of the chest, rather than to put on a large garment that will overheat the body generally. A perforated buckskin under-jacket is a convenient garment to wear; if unperforated it retains too much perspiration and vitiated air. A flannel jacket which can be frequently washed, is better. The bed-clothing of the phthisical should receive special attention. It is better to sleep in a warmer atmosphere than to use a large amount of bed-clothing, so that there may be a free escape of the vitiated air from the surface of the body, but proper ventilation of the sleeping-room should never be neglected to gain the point. Delicate children are very liable to get chilled by the displacement of their bed-clothing. This can usually be remedied

by tying the covers down all around the bed, or by having the child's night clothing made in the form of a bag; if night drawers are used, the legs may be made long enough to sew up at the ends. A very important practice for the delicate person to attend to, is regulating the amount of clothing, according to the daily temperature, as well as to the season. Such persons should always carry about with them sufficient clothing to meet sudden emergencies, and should never allow themselves to become over-heated from excessive clothing. In taking exercise, particular care should be used to exercise in comparatively light clothing, and when resting, to put on additional covering, so as to prevent the too sudden conveying away of the heat of the body, or the too sudden evaporation of perspiration. It must be borne in mind that the weaker the patient, and the less active his circulation and heat-producing processes, the more clothing he will need to conserve the little heat he may be able to generate.

Social Habits and Surroundings in their Relation to Phthisis.

Man is a social and imitative animal. Outside of the natural pleasure taken by him in congenial society, it is an absolute necessity, to a certain degree, that he should live in close masses, owing to the extremity to which the principles of the laws relating to the subdivision of labor are carried out, in our modern state of civilization. This massing together of human beings brings about the evils of over-crowding in dwellings; the accumulation of filth; atmospheric contamination; lack of proper food, and of personal cleanliness; promiscuous sexual intercourse, and a generally depressed state of morals, which always becomes prevalent under these circumstances; from all of which naturally follow crime and intemperance, and venereal and other diseases. As the individual imitates the habits and customs of those who surround him, it will be seen, that one who is exposed to such irritating and depressing influences as are the inevitable results of

such a social state, must suffer. Other things being equal, the production of phthisis, and the obstacles to its successful treatment, are in direct proportion to the social depression of a people. If there were no other causative influence at work than that of a low and ignorant social state of a part of the population, phthisis would remain a prevalent disease. If phthisis is to be prevented, it follows that rigorous regulations as to the overcrowding of habitations, their proper construction, especially in regard to affording good light, ventilation, and drainage, and regulations as to cleanliness, both in private and public places, would be imperative necessities among the lower grades of society.

Furthermore, the diffusion of knowledge as to the hygienic conditions necessary to good health, would also be imperative. Examples of such knowledge would relate to the art of eating, the laws which should govern the procreative function, etc. If a cure is to be brought about in a phthisical individual

of low social status, his removal to favorable social surroundings is an absolute necessity.

Individual Habits in their Relation to Phthisis.

Man is a creature of habit, and this is not only so of a man as a complex whole, but it is true of each organ, or anatomical element entering into his composition. When a tissue becomes habituated to acting in a certain way, it has a tendency to continue this manner of action, whether that action be normal or pathological. This phenomenon of habit is so strong, that it may be sent down through generation after generation, to a far distant posterity.

It has been before remarked that man is an artificial animal, and his artificial nature has been brought about by the accidentally acquired habits of individuals, perpetuated in their posterity. While habit is largely a matter of inheritance, it can also be acquired, and is regulated in a measure by the control of the mind. This being so, the importance

to the phthisical individual of correcting habits prejudicial to himself, and of adopting others that will have a favorable influence upon him, becomes manifest. There are a number of habits which have a direct relation to phthisis, either through their good or evil influences. The individual of phthisical tendency should form the habit of taking as much sleep and rest during the twenty-four hours, as will suffice for the building up and complete regeneration of all his tissues that may have been used during the hours of functional activity. The time which should be given to sleep and rest, depends entirely upon the particular activity of the nourishing and tissue building processes of the individual. The slow tissue-builder needs the most sleep, and as a rule, nervous people, whose tissue waste is great, also require a great deal of sleep. About the only general law that can be formulated on the subject, is that enough sleep should be taken to refresh the individual. The position taken in sleep is a matter of importance.

The habit that some people indulge in, of sleeping in a curled up position, is not desirable. The most healthy position for the development and maintenance of a good pulmonary apparatus, is to lie flat on the back, with the head only moderately raised. A correct habit in this respect should be cultivated. Every one should adopt the habit of sleeping in a well ventilated room, and of airing the bed-clothing thoroughly to rid it of the excretory emanations from the body, which may have been absorbed during the night. It is well to make a note of the beneficial effect and practice of sleeping in different under-clothing from that worn during the day. Personal cleanliness is a most important habit to be cultivated in the prevention of phthisis.

If the greatest purity of air is to be enjoyed by the individual, he certainly has to exercise scrupulous cleanliness, not only as to the surface of the skin, but as to the interior of his nose and mouth as well. Any one with a number of decayed teeth, holding masses of putrefying food

between them, or with an offensive nasal catarrh, inhales into his lungs at every breath, an atmosphere that must exert a depressing and deleterious effect upon his general health, as well as upon the pulmonary organs. Regular visits to the dentist, the use of the tooth-brush at least twice each day, after each meal would be better, and appropriate treatment of the catarrhal trouble will correct these defects. Washing the body not only serves the purpose of cleanliness, but it encourages a healthy action in the skin, which, in phthisis, has an important derivative effect. In the prevention of phthisis, the regular use of the cold bath is one of the most effective means that can be adopted. It may be taken in any form, but, usually, cold sponging is preferable. This can be so regulated that the cold water can be applied to a greater or lesser surface of the body at one time, at any degree of temperature suited to the case in hand. A brisk rubbing with the sponge is a most important factor in the process. The cold bath acts beneficially,

through the tonic influence of cold. A certain amount of shock is a necessity to the carrying out of the vital functions of the body. The various organs of all animals act responsively to the stimulus of shock of one kind or another. This is so of man, from the first shock that the cold air of the outer world has upon the newly-born infant, which causes him to give the first respiratory gasp, until the individual lies down to die, having become so used to every kind of shock, that his organs, worn and deteriorated in shape and quality by long use, will not take cognizance of anything further in the way of stimulus. The regularly used cold bath, not only affords a shock that has a stimulating effect upon the general nutritive processes, but it also so accustoms the individual to the effect of exposure to sudden cold, that he is very much less liable to feel the effect of undue exposures which result in the deleterious "colds" so often experienced by the phthisical individual. It should be noted that if the cold bath is not followed by a reactionary glow, it should be dis-

continued, or moderated in severity, as it will then do harm by its depressing influence upon the system. Sea bathing is usually more vigorous than fresh-water bathing. The action of the salt water is rather more irritating to the skin than fresh, and the buffeting of the surf affords an increased general stimulus. A very beneficial bath for very delicate invalids, is one where the bathing fluid is diluted alcohol. Some of the alcohol is absorbed through the skin, and the afterglow is more sure to be produced. Long, hot baths cannot be recommended to the phthisical person, on account of their depressing effect; and the hot bath, followed by the cold douche, is rather too severe for any but a vigorous person. Hot sponging is very useful in checking the sweats of phthisis. The habit of eating proper articles of food must, of all things, be cultivated by the phthisical individual. It is quite customary for thin people to desire those varieties of food that mostly go to build up the muscular system, while the corpulent will almost in-

variably evince a fondness for those alimentary substances which will produce fatty tissue. A correct habit in this respect can be cultivated, to a great extent, and should never be neglected. Furthermore, personal acquisition of a taste for deleterious articles should be carefully avoided. Tea, coffee, and other nerve stimulants, should be denied to the young, and the alcohol, opium and tobacco habits, avoided at all ages. There are some cases in which smoking may not produce a very perceptible injury, but the delicate mucous membrane lining the air passages of the phthisical lung, is usually irritated by the inhalation of tobacco smoke, even if the habit does not have a deleterious effect upon the nervous system, as is almost universally the case. A prominent Austrian sporting baron induced phthisis, and died from it, through excessive smoking, in order to give his family the benefit of a large insurance upon his life.

The sexual relation may be said to be almost always habitually abused. Nature has given man ability to receive pleasure

through the functions of the reproductive organs, and it seems reasonable that these functions should be rightly used; but there is no excuse for the abuse of these functions. Co-habitation, under the restriction of lawful wedlock, is sanctioned by the social consent of all peoples, but multitudes are continually kept in a state of depression and unfitness for active usefulness in the world, by excessive indulgence in, or abuse of the sexual act. Here again is one of the depressing influences which have an indirect, but important bearing to our subject. Regularity in the practice of good habits may be alluded to as being very desirable for the maintenance of health on a high plane.

It cannot be too strongly impressed upon the mind of the individual of phthisical tendency, that he, of all men, must live on such a high physical plane, if he would avoid the disease, which is always liable to fasten upon him while he is living a life of low physical status. Such a person should have his meals regularly, and should see that a daily fecal evacuation

takes place at a regular hour; this caution is especially applicable to women, and to persons of sedentary habits. The place for defecation should be so arranged in regard to convenience and comfort, that it should be a solicitation to the act, rather than a cause for dread, as it so commonly is, in so many household establishments. He should go to bed in season, and should have a methodical life well mapped out before him, so that he may foresee, if possible, the injurious influences that he will have to meet and provide against. He should avoid evening dissipations and large assemblies of all kinds. He should avoid long rides in badly ventilated railroad cars; as for open stages and street cars, they are death-traps for the consumptive. In general, he should cultivate the art of taking care of himself. It is astonishing to see how long a phthisical individual will sometimes live, if he only knows how to, and will take care of himself. Patients should form the habit of restraining the act of coughing as much as possible, rather than to

depend upon sedative medicines to produce a quieting effect. It is desirable that there should be no more coughing than is absolutely necessary to free the air passages from accumulated mucus, etc.; and, of course, the fewer medicines a patient takes, the better it is for his stomach, and for him.

Ventilation and Heating in their Relations to Phthisis.

It may at first seem strange that the farming population of our Northern States, which has within its grasp the advantages of pure air, exercise and proper food, should furnish so great a number who become the victims of phthisis. There are numerous causes which conspire to bring about this undesirable result; among others, unfavorable climate, starvation and over-work. Furthermore, and notwithstanding the many advantages for hygienic living which they may enjoy, the farmer and his family are usually great trespassers against the laws of hygiene. Perhaps in nothing else is this

more forcibly illustrated, than in the poor ventilation and over-heating of the living rooms of the family dwelling. The usual near vicinity of barn-yard, pig-pen, chicken-house, etc., do not conduce to great purity of air in the warmer season, when doors and windows are freely left open; but in the cold weather, it is unusual to see the slightest provision for the entrance of pure air into, or the egress of foul air, from the dwelling. The sleeping apartments are usually nearly air-tight, and so the atmosphere breathed by the inmates is usually more or less foul, depressing, and irritating. Furthermore, the apartment in which the family gathers, is commonly over-heated, while the other parts of the house are usually very cold and damp. Thus we have another cause for irritation and shock in the extremes of temperature to which the inmates are subjected, in passing from the over-heated room, which has had a weakening tendency, to the outer air or to the colder parts of the house. The evils of bad ventilation are even worse in the

habitations of the working classes in the cities. The travelling public is, as a rule, generally subjected to the evils which result from bad ventilation and heating.

Hotels are notoriously bad in these respects, and railway stations and cars, are contrivances which furnish travellers with a supply of air, almost entirely lacking in good qualities, both as to purity and temperature. Corporations are supposed to be devoid of soul, and it is only here and there that one is far-sighted enough to appreciate that the good health of its passengers is a matter of sufficient importance to require their attention.

It may be stated that there can be no such thing as perfect ventilation in any closed apartment. Nothing but exposure to a breeze in a pure out-of-door atmosphere, will give an approach to perfection, in this respect. The quantity of fresh air that should be introduced into an apartment can only be generally designated. An individual might be kept alive, if only fifty cubic feet an hour *were* given to him to breathe, but nothing

short of two thousand feet per hour, for each individual, could be considered as giving purity of atmosphere in an occupied apartment. The phthisical person should beware of becoming habituated to the use of a deficient supply of fresh air, and less sensitive to the ill effects which are produced by the deprivation.

The great agency at work in ventilating the habitations of man, is the diffusive force of gases. Fortunately, this is so powerful a force, that the ordinary materials of which habitations are constructed, offer no irresistible obstacle to its being carried into effect. The process is facilitated by the means of transit offered to the diffusing gases, by cracks and holes, windows, doorways, chimney flues, and special avenues constructed for ventilating purposes. If the dispersion of the effete gases and the ingress of fresh air, were all that was to be gained by ventilation, the process would not be difficult; but in addition, organic impurities and watery vapor have to be disposed of, and this necessity requires that a certain

amount of motion should be given to the air in a room, or in other words, a draught has to be produced. This is done by means of heating the air to a certain degree above that of the outer atmosphere; by the displacing force of winds; or by the mechanical processes of forcing or drawing out the vitiated air. In domestic practice, the most convenient method of effecting the removal of vitiated air from apartments, in mild weather, is by the free opening of doors and windows; and in cold weather, by the use of ventilating flues alone, or of flues assisted by the apparatus used for heating or cooking purposes. The flue acts in the removal of vitiated air, either by the suction force induced at the top of the flue by winds, or by the heating of the gaseous contents of the flue, in which case the contents become lighter, and expanding, rise; the colder external air under atmospheric pressure, forcing the vitiated air up the flue. Thus it will be seen that the air flue is the analogue of a continuously acting air-pump. In

the modern system of heating with the cellar furnace, provision is usually made for a fresh supply of air, by means of an air-duct, leading from outside the building to the furnace chamber, where it is heated, and then conducted to the different apartments of the house. This air supply should never be taken from the cellar, and care should be exercised lest any source of impurity near the entrance to the air-duct should contaminate the entering air current. The cellar should be kept scrupulously neat and clean, and free from decomposable or odoriferous matters, as it is almost impossible to prevent some of the air from the cellar from gaining entrance to the heating chamber of the heater and air conductors.

In cases where a stove is used for heating an apartment, some means for the admission of fresh air must be provided. Either a tube may be led from the outer air and open under the stove, or a ventilating aperture may be made near the top of the room, or a window may be slightly lowered from the top. This lat-

ter method is one of the most feasible ways of securing ventilation, for either sleeping or living rooms. It should always be practised in sleeping rooms, unless special means for ventilation exist. A direct draught from the opening upon the sleeper should be avoided. This can be done by opening a window on the opposite side from which the wind blows, or a board may be fitted into the upper part of the window casing, at an angle of forty-five degrees, so that it will receive the first force of the wind, which, being directed upward, becomes diffused and loses its power. The window blinds may be used for this purpose, the slats being placed at the proper angle. If the necessities of ventilation make the room too cold for the delicate invalid, a fire must furnish the necessary heat; but an abundant introduction of fresh air into the sleeping apartment must *never* be neglected in the treatment of phthisis. The ordinary chimney flue offers an excellent means of ventilating the rooms which are connected with it, and of course acts all

the better, if there is an open fire in it. If there are plenty of loose windows and doors in an apartment, an active open fire will create such a draught, that usually, sufficient fresh air will be introduced into the room through the various cracks without providing special means for its admission. These cracks should not be closed by weather strips; these latter, so-called comforts, do an incredible amount of mischief to the health of the community. It is desirable to have at least a small avenue for the escape of vitiated air at the top of a room, so that a movement of the watery vapor and organic impurities collected there, may be facilitated; for, with only the ordinary low openings of the chimney flue, there is liable to be some stagnation in the air at the top of the room. The household heating apparatus may be briefly considered in this part of the subject, as its proper use is of importance in effecting the ventilation of habitations, as well as in furnishing the amount of heat desirable for the inmates. The method of heating

which will keep one in vigorous health, is undoubtedly the open fire. This method of heating warms the body by direct radiation, without injuriously heating and drying the atmosphere breathed. It serves the purpose of keeping the air warm enough to prevent a too rapid loss of bodily heat; its cheerfulness produces a beneficial effect through the mental faculties, and it has the tonic effect produced by a certain amount of irregularity in the supply of heat, the body being alternately exposed to varying degrees of heat and cold. A baby with an ordinary amount of inherited vigor will be much more healthy, and will not "take cold" so readily, if it is reared by the open fire, alternately experiencing the range of temperature which is found between the hearth, and the colder parts of the room near the windows, than it will if it is brought up in the equable temperature of the furnace-heated apartment. The open fire has some disadvantages; requiring much care and consuming much fuel. It is difficult

to regulate according to the weather, and housekeepers object to its uncleanliness, but this objection can be met by proper care and the selection of the best fuels. Though it is *the* method of heating to *maintain* a vigorous health status, by itself alone it is not the best method of heating for the delicate phthisical invalid in very cold weather. For such persons, it is too unequal in its heating qualities ; the extremes of cold on one side, and of heat on the other, result in too tonic and irritating an influence on the invalid who may be in the active stage of phthisis. *Supplemented* by a supply of moderately heated air from a properly constructed furnace, it becomes the *ne plus ultra* of heating appliances for the phthisical individual.

The open grate soap-stone stove is a compromise between a stove and a hearth fire. It is more easily regulated than the latter, less expensive in regard to fuel, more cleanly, very cheerful, and fulfils a very good office in the invalid's room. We are inclined to think that the stove

is an apparatus that is too often unjustly abused. No doubt there are many stoves that are very bad indeed, but there are some good ones. It is the only convenient, and in fact the only feasible apparatus, for furnishing heat in cold weather, to people of moderate means, in regions where fuel is expensive. Properly constructed, it offers great advantages for economy in the use of fuel; is easily managed, so that the amount of heat produced can be regulated, and withal, is a very good ventilator.

It must be understood that a stove to be efficiently hygienic, must be so large that it will not require overheating, and must have a *large* smoke flue provided for the direct escape of the products of combustion.

The damper of the smoke flue should be so constructed that it can never entirely close the flue. If a stove is used, the directness of the draught is imperative, and it is absolutely necessary, for the complete escape of all the products of combustion and the proper ventilation

of the apartment, that there should be a considerable loss of heat up the chimney flue. All those returnable flue, all the heat-saving, patented complex machines, so often called "parlor stoves," should be avoided by the phthisical invalid, and a simple, direct draught stove, preferably constructed of soap-stone, should be adopted. In this luxurious day, men of independent means do not live on a very high physical plane. In fact, most persons prefer to live on a low plane, and run the risks consequent upon such living, rather than to forego the comforts and luxuries of the present day. For all such, the household furnace is a necessity. When properly constructed, it is easy of management, cleanly economical, and gives the whole interior of the house the balmy atmosphere of summer.

The best, but most expensive appliance of this kind, is the hot water furnace. This consists of a heater and radiators containing water, which may be heated to any degree under 212° F. Usually

a separate set of radiators is placed in an air-heating chamber under the flue that leads to each apartment. This apparatus furnishes a mildly heated, moist and very pure air. It is very expensive to introduce, but it is the most economical in use, and gives a more continuously equable, easily regulated heat than any other heating contrivance. The first cost of the steam furnace is less, but it is inferior, being difficult to regulate in the production of *mild* degrees of heat, and is liable to accident from explosion. The steam heater, with radiators introduced into the sleeping and living apartments, without any provision being made for ventilation, is about the most unhygienic heating apparatus known. If open fires are used with it, it answers well in those cases where it is difficult to convey heated air through flues. The most universally adaptable furnace, because of its reasonable first cost and its ease of management, is the iron furnace. If properly constructed, it supplies heated air of a fair quality. It should always be so large that it will

not require over-heating, and it should be frequently examined to discover any defects. It should have a large escape flue with a powerful draught, so that there may be a complete and speedy escape of the products of combustion, and it should always be so arranged as to supply moisture to the heated air, which would otherwise be too dry, and exert a deleterious effect upon the surfaces of the body, both external and respiratory. These precautions being taken, the iron furnace is, by no means, the demon of general pathological production, that some would have us believe. Phthisical individuals, in changing to winter climates, should remember that at even the mildest of our Atlantic coast resorts, they may experience periods of severely cold weather, and meet such contingency by providing themselves with a proper heating apparatus and a supply of fuel.

THE OFFICE OF MEDICINES IN THE TREATMENT OF PHTHISIS.

It has been the earnest hope of the medical profession, as well as of others, in times past and present, that some *specific* remedial cure for phthisis might be found. The finding of such a boon is something to be devoutly desired. Many remedies have been brought forward as supposable specific cures for the malady, but all have proved disappointing. At the present time there seems but little prospect of the discovery of such a remedial treasure-trove. In the treatment of phthisis the use of medicines subserves a subordinate part in comparison with hygienic therapeutics; but such use is so important, that it must not be disregarded. Although medicine is not given with the direct view of a specific influence on the disease, it may be most advantageously administered with a view of promoting the building up and the mainte-

nance of the bodily tissues in that elevated health status which is our only hope for staying the progress of the phthisical process. In multitudes of cases, successful treatment depends upon the co-operative aid of medicaments, in conjunction with the general hygienic treatment. *Millions* of human beings could be saved from the ravages of this disease, if a simple *tonic* could be administered to them, at just the right period. The temporary help which they would receive at this critical time, would give the pulmonary tissues sufficient ability to resist the commencing action of the disorder. The giving of medicines in these cases, is mostly for the purpose of improving the general nutrition of the patient. In administering drugs to the phthisical person, the use of opium, or of any substance that will have a deleterious effect upon the general system must be avoided as far as possible, and only adopted as a last resource. Above all, care should be taken not to use any drug which will injure the stomach. Among the undesirable conditions which

can be advantageously combated through the agency of the *Materia Medica*, are the following:—Individually peculiar, bad nutritive conditions. Poor, low states of nutrition, with weak heart action, etc. Acute bronchial and pleuritic attacks. Painful conditions of the chest walls. Excessive cough and expectoration of offensive decomposing matter. High temperature and sweating. Accompanying laryngitis. Sleeplessness. Loss of strength and vital action.

Prominent among the medicaments used in this disease, are alcohol, quinine, cod-liver oil, opium, etc. Though opinions may differ as to the expediency of giving *alcohol* to the phthisical patient as a beverage, there can be no doubt as to its value when administered medicinally. It is given to support the patient during very low conditions; for its anodyne effect; to reduce heat and to repress too active tissue changes; to support and stimulate the heart's action; to aid deficient digestive ability; to afford a little additional force and energy, and to in-

crease the circulation at the surface of the body.

Quinine, or the similar cinchona alkaloids, may be used in small doses, for their tonic effects. In large doses, they are highly prized for their efficacy in controlling the temperature, sweats, and local diseased process in the lungs. In acute cases they do not seem to possess so much power in controlling the temperature.

The *Iron* preparations are useful for their general nutritive effect, being especially indicated for patients who have poor, thin blood.

Cod-Liver Oil is valuable not only as a food, but also because of its medicinally tonic and other influences. It thus fulfils a two-fold purpose; for while its fatty elements are utilized as a food, the peculiar principles which it contains, exert their tonic and otherwise generally beneficial nutritive effects. It sometimes improves digestion and controls the diarrhœa, while at other times it has a contrary effect.

Opium will allay excessive cough, give

sleep, and may be used for its stimulating effect in case of need. With chalk and other ingredients, it is used for the diarrhœa. It is valuable in mixtures, and is used in the form of sprays for local applications to the larynx and trachea. It should never be given until the failure of milder remedies necessitates its use, and it should be administered at the start in the smallest doses that will produce the desired effect.

Oxygen Gas is variously rated as a beneficial agent in the treatment of phthisis. In some cases, the effect of its inhalation is very good. It appears to succeed better with the phlegmatic, than it does with nervous individuals. It gives the patient some increased force, and stimulates the general system. Three or four gallons are breathed each day. It is administered from an elastic bag, which has a breathing tube to be applied to one nostril, air being breathed at the same time through the other.

The *Hypophosphites of lime and soda* have had an extensive reputation as a

specific remedy for phthisis. This remedy seems to have succeeded better in the hands of its introducer, Dr. Churchill, than in the practice of the profession generally. However, this medicine, besides furnishing phosphates to the body, is a good general tonic; it sometimes improves intestinal digestion, and not infrequently acts beneficially through its psychical influence.

In correcting individually peculiar malnutritive conditions, each case must instigate the selection of remedies appropriate to its needs.

In poor, low states of nutrition, with poor heart action, etc., we can bring a long list of remedial agents to bear, including cod-liver oil, iron, quinine, digitalis, arsenic, the simple bitters and aromatics, pepsine, and pancreatine, alcohol, the phosphates, hydrochloric and lactic acid, etc., etc. When there is deficient digestion of the starches, diastase is indicated. It may be given in the form of malted barley, or of the fluid malt extracts.

In correcting disordered conditions of

the digestive organs, good effects are often produced by bismuth, hydrocyanic acid, nux vomica, the mineral acids, silver oxide, astringents, laxatives, etc. Raw scraped beef is frequently of service in controlling vomiting; part of a teaspoonful being given at one time in sandwich form.

Acute Bronchitis and Pleurisy can be decidedly ameliorated, and even cured by our pharmacopœia. We are inclined to think that physicians as a rule are liable to give too little consideration to ordinary colds or bronchial attacks, regarding them as of no great consequence. In cases of phthisis, their prompt and thorough treatment is of great importance. Usually, if a person appreciates the approach of the period of chill which indicates the taking of a cold, the result can be aborted by *immediately* taking a large dose of some alcoholic beverage. Even if a cold be under headway, it can be limited to a small portion of its natural course by energetic internal treatment and local application of appropri-

ate remedies. Chronic bronchitis is always an accompaniment of the chronic phthisical process, and its proper treatment by the inhalation of appropriate astringents and other sprays, should always be practised. This diseased process can be effectually held in control and will assist most materially in bringing about a cure of the more serious condition.

The coincident pleurisy and pains in the chest may be relieved by belladonna, mustard or pepper-plasters, dry cups, flying blisters, iodine, or by hot applications, either wet or dry. The former may be an application of turpentine and hot water, and the latter may be in the form of a rubber bag of hot water, or a bag of hot salt. Ironing the painful spot with a hot smoothing-iron, is also a convenient method of relieving this troublesome symptom.

Excessive cough and expectoration of offensive decomposing matter.—A certain amount of cough is absolutely necessary to relieve the air passages of superfluous

matters which may be the result of either healthy, or diseased action; but when the cough is harassing, prevents rest, and is painful, it should be controlled; and for this purpose, there may be used locally or internally, chloroform, conium, æther, hyoscyamus, hydrocyanic acid, chloral and the bromides, and in extreme need, opium. In regard to the expectoration, internal medication may be used in conjunction with the inhalation of atomized sprays, using for the latter, solutions of the alkalies, arsenic, carbolic acid, permanganate of potash, benzoin, creosote, ipecacuhana, iodine, turpentine, the astringents, etc.

The high temperature and excessive sweating may be mitigated by giving large doses of quinine, or the salicylic compounds, for the former; and for the latter, by bathing the surface of the body with alcohol, astringents, weak acids, or by hot sponging in conjunction with the internal administration of belladonna, chloral, quinine and digitalis.

In treating the Chronic Laryngitis that

may accompany phthisis, the local applications should be made by a physician who is familiar with such work. The amount of relief which can be offered to the patient having this particular complication, is of inestimable value. The trained physician can make direct cleansing, astringent, sedative and soothing applications to the diseased spots; or inhalations may be taken by the patient himself, which afford great relief.*

Refreshing sleep is absolutely necessary to the patient, and to secure it, resource to all the hypnotics, even including the opium compounds, is justifiable.

Failure of strength and vital action.—Although we depend mostly upon general hygienic principles to combat this tendency, the various medicinal heart stimulants, such as ammonia, alcohol, etc., are of great assistance.

* The newly discovered local anæsthetic *Cocaine* will probably prove to be of great value in these cases. The condition may be so painful as to prevent swallowing, yet a slight spray of *Cocaine* on the diseased parts will absolutely relieve the pain and thus allow of a sufficient nutritive supply being swallowed.

THE POLITICAL DUTY OF THE PEOPLE IN RELATION TO PHTHISIS.

THE lay portion of the community has a duty to perform in regard to the enormous production of phthisis, and its terrible results in civilized communities. Every individual should be ready to do his part in connection with this duty. It is unfortunate that so important a duty should only receive *general* attention and interest. The medical profession may raise its voice, but the decisive action that will control this malady, must come from an instructed, enlightened populace. Popular governments are merely instituted to carry out such measures as will be conducive to the welfare of the people. They are the people's executive committees, so to speak.

Among the other duties of such a government, is that of providing for the sanitary welfare of the people who have created it. The best governments have

recognized this duty in the appointment of medical departments that shall have this matter in charge. Of course it is a debatable question as to how far such a department should extend its influence for the sanitary elevation of a people. Our own national health department, so far, seems mostly to have restricted its office to merely protecting the people from outside malign influence. The writer is of the decided opinion that a government falls short of its duty, if it does not carry its influence by instruction, and if necessary by enforced regulations, into the daily habits of life among the people. When it is considered that about a hundred thousand of the citizens of the United States die yearly from phthisis alone, is it not reprehensible that our government should not be actively at work, in spreading abroad the information, and in enforcing those sanitary regulations, which would lead not only to a great decrease in this death rate, from phthisis, as well as from other diseases, but which would also afford incalculable alleviation to all

the attendant misery that such a state of ignorance, or wilful wrong-living spreads abroad through the land?

The great majority of our people, being by reason of the social conditions which surround them, unable to attain the knowledge which would relieve them from this particular scourge of phthisis, and enable them to escape from the influences producing it, have a right to expect from government such action as will correct so great an evil. An enlightened government owes to its people, such regulation of the marriage relation, that the production of worthless progeny would be brought down to the smallest possible per centum. It should provide for its people practical methods, through which sanitary knowledge might be brought within the reach, and if need be, even enforced upon each and every individual of its population. It should see that its people are not allowed to dwell in badly drained, or over-crowded localities, that the poorer classes should have decent habitations; enough food to eat; that

industry should be enforced, if necessary; and that the managers of deleterious industries should be caused to take all practicable precautions against those influences causative of disease.

Until such a state of affairs is brought about, no great decrease in the phthisical death-rate is to be expected.

CONCLUSION.

As a general deduction from what has been written, it will be just to add that the treatment of phthisis is not one of simple routine; but that it is one of close attention to many small matters. We have merely touched on many of these points in the previous pages, but the reader must not conclude that any one of them is unimportant. Furthermore, the treatment of phthisis requires the application of a large amount of general knowledge and experience, seldom possessed by any one but the trained physician. The success of such a physician in his treatment, depends largely upon the ingenuity and skill with which he applies his general knowledge and experience, in the treatment of the case in hand. As no two individuals are just alike in their structure, or in the method of their lives, or their diseased processes entirely

similar, or the causes which have produced their malady the same, all do not require the same treatment. Also, if a cure is to be effected, the patient must be surrounded with conditions which are at least fairly favorable for the attainment of such a result. Above all, in the general treatment of phthisis, the main ideas to be kept prominently in view are, that mal-nutrition, atmospheric contamination, and unhygienic habit, must be combated and corrected.

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